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RESEARCHES ON THE MOLECULAR DISSYMMETRY OF NATURAL ORGANIC PRODUCTS.

By L. Pasteur, Member of the Chemical Society of Paris. Presented to the Chemical Society of Paris, January 20 and Febuary 3, 1860. Translated from "Leßons de Chimie professées en 1860." By W. S. W. Ruschenberger, M. D., U. S. Navy.*

SECOND LECTURE.

If we consider material objects, whatever they may be, in the relation of their forms and of the repetition of their identical parts, we shall not be slow to perceive that they are distributed in two great classes, thus characterized: Some placed before a mirror give an image which to them is superposable; the image of others would not cover them although it faithfully reproduces all their details. A straight stair, a stem of distich leaves, a cube, the human body, are bodies in the first category. A winding stair, a stem of leaves spirally inserted, a screw, a hand, an irregular tetrahedron, are so many forms of the second group. These latter have no plane of symmetry.

We know on the other hand that compound bodies are aggregates of identical molecules, themselves formed of assemblages of elementary atoms distributed according to laws which regulate the nature, the proportion, the arrangement of them. The individual, for every compound body, is its chemical molecule, and this is a group of atoms, not a group pell-mell; there is, on the contrary, a very determinate arrangement. Such is the manner in which all physicists represent the constitution of bodies.

This stated, it would have been very astonishing had not nature, so varied in her effects, and whose laws permit the existence of so many species of bodies, offered in the atomic groups of

* Continued from page 16.

compound molecules both of these two categories in which all material objects are distributed. In other words, it would have been very extraordinary, if among all chemical substances, natural or artificial, there had not been individuals with a superposable image and others with an image non-superposable.

Things happen in fact as might be naturally anticipated; all chemical combinations, without exception, are equally distributed in two classes; those having an image superposable, and those having an image not superposable.

II.

It is easy to show that this is a legitimate consequence, necessary from our first comparison. To place it in clear light I will briefly recall the principal conditions of the decisive experiment which closed the preceding lecture.

I prepare by the aid of natural paratartaric acid, the paratartrate of soda and ammonia. It is deposited in beautiful crystals.

Observed in a polarizing apparatus, a solution of any portion of this double salt offers no indication of optical deviation; and in separating from the crystals the acid which they contain, paratartaric acid, identical with that which served to form them, is reproduced. So far all is simple and natural, and it seems as if we had to deal with the crystallization of an ordinary salt. There is nothing of the kind, however.

Take another portion of the same crystals and examine them one by one. You will find that one half has the form, a model of which I here present, characterized by a non-superposable hemihedrity; that the other half has the inverse form identical with the first in all its respective parts, and yet cannot be superposed on it. Then let the two kinds of crystals be isolated to be dissolved separately, and we observe that one of the two solutions deviates the polarized light to the left and the other to the right, and both equally.

If we extract by the ordinary chemical processes the acids from these two kinds of crystals, we perceive that one of them is identical with common tartaric acid, and that the other is in all points similar, except that it cannot be superposed on it. They bear to each other the relations of the two salts from which they

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were separated. They resemble each other as much as the right hand resembles the left, or as two irregular symmetric tetrahedrons resemble each other, and these analogies and these differences are found in all their derivatives. What can be done with one may be repeated with the other under the same conditions, and the resulting products constantly manifest the same properties, with this single difference, that in some the deviation of the plane of polarization is to the right, and in others to the left, and that the forms of corresponding species, although identical in all their details, cannot be superposed.

All these facts, so clear, so demonstrative, oblige us to refer the general exterior characters of these acids and their combinations, to their individual chemical molecules. Not to do it would be to ignore the rules of the most common logic. It is thus we arrive at the following conclusions:

1st. The molecule of tartaric acid, whatever it may be otherwise, is dissymmetric, and of a dissymmetry with an image non-superposable. 2d. The molecule of the left tartaric acid is formed precisely by the group of inverse atoms. And by what characters shall we recognize the existence of molecular dissymmetry? In the one case by non-superposable hemihedrity; in the other, and especially by the rotary optical property when the body is in solution.

These principles being stated, let us examine all bodies, whether from nature or the laboratory, and we shall find easily that among them a great number possess both this kind of hemihedrity and the molecular rotary property, and that all others possess neither the one nor the other of these characters.

I was right, then, in saying: The legitimate and forced consequence of our first lecture may be thus expressed:—

All bodies (I use this expression chemically) are divided into two great classes; bodies with a superposable image, and bodies with a non-superposable image; bodies constructed of dissymmetric atoms, and those formed of homohedric atoms.

III.

Here we encounter a fact worthy of fixing the attention, even though we should regard it alone and isolated from the whole of the considerations about to follow. It is this:

All artificial products of the laboratory and all mineral species have a superposable image. On the contrary, most of the natural organic products, (I might say all, if I had to name only those which play an essential part in the phenomena of animal and vegetable life,) all products essential to life are dissymmetric and of the dissymmetry which causes their image to be non-superposable.

Before proceeding further, I desire to set aside some objections which cannot fail to present themselves to your minds.

IV.

Quartz, you will say at once? We have seen in the last lecture that quartz possesses the two characters of dissymmetry, the hemihedrity in form observed by Haüy, and the rotary phenomenon discovered by Arago. Nevertheless, all molecular dissymmetry is absent in quartz. To understand it, let us advance a little further in the knowledge of the phenomena we are considering. We shall find, moreover, the explanation of the analogies and differences already previously indicated between quartz and natural organic products.

Permit me to describe roughly, though in the main accurately, the structure of quartz and that of natural organic products. Imagine a winding stair, the steps of which shall be cubes, or any other object with a superposable image. Destroy the stair, and the dissymmetry will have disappeared. The dissymmetry of the stair was the result only of the mode of putting together its elementary steps. Such is quartz. The crystal of quartz is the stair all built. It is hemihedric. For this reason it acts on polarized light. But let the crystal be dissolved, melted, its physical structure destroyed in any manner, and its dissymmetry is suppressed, and with it all action on polarized light, as would happen, for example, in a solution of alum, a liquid formed of molecules of a cubic structure distributed without order.

Imagine, on the contrary, the same winding stair formed of irregular tetrahedrons for steps. Destroy the stair, and the dissymmetry will still exist, because you have to deal with an assemblage of tetrahedrons. They may be in any position, but each one of them will have its proper dissymmetry, nevertheless. Such are organic bodies in which all the molecules have

a proper dissymmetry, which is translated in the form of the crystal. When the crystal is destroyed by solution, there results from it a liquid active for polarized light, because it is formed of molecules pell-mell, it is true, but each having a dissymmetry in the same direction, if not of the same intensity in all directions.

V.

Quartz, then, is not molecularly dissymmetric, and up to the present time we do not know any example of a mineral which possesses molecular dissymmetry. I have said that we must extend this proposition to the artificial compounds of laboratories. Here still we may have some scruples. We may object, for example, that native camphor, which is dissymmetric, yields artificially camphoric acid, also dissymmetric; that aspartic acid derived from asparagine by a reaction in the laboratory is dissymmetric like asparagine, and I might cite many other like examples. But no one doubts that camphoric and aspartic acids owe to camphor and to asparagine their proper dissymmetry. This exists in the mother products, and it is transferred, modified more or less by substitution, from the mother products to their derivatives. We are unable to produce better evidence, in general, of the preservation of the primitive type in a series of products connected by a common origin, than the permanence of the optic property.

When I affirm that no artificial substance has yet presented molecular dissymmetry, I mean to speak of artificial substances, properly so called, formed entirely of mineral elements or derived from non-dissymmetric bodies. For example: Alcohol is not dissymmetric. Its molecule, if we could isolate and study it, placed before a mirror, would present an image superposable to it. Now, there is no derivative from alcohol which is not dissymmetric. I could multiply examples of this kind without end. Further, take any dissymmetric body, and if you subject it to somewhat energetic chemical reactions, you will assuredly see the dissymmetry of the primitive group disappear. Thus, tartaric acid is dissymmetric. Pyrotartaric acid is no longer so. Malic acid is dissymmetric. Maléic and paramaléic acids of M. Pelouze are not. Gum is dissymmetric, mucic acid is not.

Artificial products, then, have no molecular dissymmetry; I do not know how to indicate the existence of a more perfect separation between the products originating under the influence of life and all others. We insist a little, because you will see in the sequel of this lecture the physiological aspect of these studies disengages itself more and more. Let us pass in review the principal classes of natural organic products:

Cellulose, feculæ, gums, sugars; tartaric, malic, quinic, tannic acids; morphia, codeia, quinia, strychnia, brucia; essences of turpentine, of lemon; albumen, fibrin, gelatin. All these immediate principles are molecularly dissymmetric. All these substances have the rotary power when in solution; a character necessary and sufficient to establish their dissymmetry, even when, in the absence of possible crystallization, hemihedrity would be wanting for the recognition of this property.

All the substances most essential to the vegetable and animal organism figure in this enumeration.

There are many natural substances which are not dissymmetric. But are they natural in the same sense as the others? Do we not necessarily see in such bodies as oxalic acid, hydruret of salicyle, fumaric acid, the derivatives of natural substances properly so called, formed by actions analogous to those of the laboratory? These products seem to me to be in the vegetable organism what urea, uric acid, creatin, glycocol, are in the animal organism, rather excretions than secretions, if I may so speak. It will be very interesting to follow this point of view experimentally.

We may add to this, that many bodies, non-dissymmetric in appearance, may be *paratartarics*. A word is wanting in chemical language to express the fact of a double molecular dissymmetry concealed by the neutralization of two inverse dissymmetrics, the physical and geometric effects of which rigorously compensate each other.

The double proposition, to which we have just been led, upon the habitual dissymmetry of immediate organic principles, and upon the absence of this character in all the products of inorganic nature, enables us to enlarge and render more and more precise our manner of viewing the subject of this remarkable molecular property.

VI.

In 1850, M. Dessaignes, whose ingenious skill is known to chemists, announced to the Academy that he had succeeded in transforming the bimalate of ammonia into aspartic acid. It was a step which tended to confirm the important results that M. Piria had obtained some years previously. M. Piria had succeeded in transforming asparagine and aspartic acid into malic acid. M. Dessaignes, in his turn, showed inversely that malic acid could be re-formed into aspartic acid.

Thus far there was nothing but what was very natural in the observation of M. Dessaignes, even in the optical point of view. For my part, I had recognised that asparagine, aspartic acid, and malic acid, were active on polarized light. The chemical passage of one of these bodies to the others was not surprising.

Some months later M. Dessaignes made another step forward. He announced that not only the bimalate of ammonia, but also the fumarate and maleate of ammonia had equally the property of being transformed by heat into aspartic acid.

Here I perceived an impossibility; or, if the thing was as M. Dessaignes asserted, this skilful chemist had made a discovery which he did not suspect. Indeed, I observed that fumaric and malic acids, and all their salts, were without action on polarized light. If, then, M. Dessaignes had succeeded in transforming their salts of ammonia into aspartic acid, he must have realized, for the first time, the production of a dissymmetric body by the aid of compounds which are not.

But it appeared to me more reasonable to believe that the aspartic acid of M. Dessaignes differed from natural aspartic acid decidedly in the absence of the molecular rotary property. M. Dessaignes, it is true, had carefully compared the properties of the artificial acid with those of the natural acid, and, as he said, found them identical. Better than any one, from the example of M. Mitscherlich, of whom I spoke at our last meeting, I knew how delicate is the determination of the identity of chemical species, in studies in which the greatest similitude of properties often conceal profound differences. I did not hesitate to believe, therefore, that the new fact announced by M. Dessaignes had need of confirmation.

I attached so much importance to the elucidation of this

question, and in the anticipation even of the results which I am about to have the honor to lay before you, that I immediately made a journey to Vendome, where I submitted my doubts to M. Dessaignes, who at once presented me with a specimen of his aspartic acid. On my return to Paris, I found immediately, in fact, that the acid of M. Dessaignes was only an isomeric of the natural aspartic acid, that is, the acid derived from asparagine, and that it differed from it, as I had foreseen, by the rotary property, entirely absent in the artificial acid, not at all doubtful in the natural acid. But all the other physical and chemical properties possessed the greatest analogies, so great that M. Dessaignes, who was not put on his guard by any pre-conceived idea, had concluded that the two substances are really identical.

What attracted me most in the examination of the new compound, (which by itself offers no very remarkable crystallizable combinations,) was its transformation into malic acid. It is indeed known that M. Piria, just mentioned, long ago gave the means of obtaining malic acid from asparagine and aspartic acid; and I was assured by the most exact proofs that this malic acid was identical with that of the service, [*sorbus*,] the apple, the grape, and tobacco.

I then treated the new acid in the manner discovered by M. Piria, and transformed it into a new malic acid very similar to the natural acid, so close to the latter, that a chemist would have great difficulty in distinguishing them, even if warned of their real dissimilarity; only this malic acid had no action on polarized light, and it was the same with all its saline combinations.

There are certain derivations of these two malic acids, the comparison of which does not very clearly manifest the true mutual dependence of the molecular arrangements of these curious isomerics, but there are others in which it is plainly seen. Let us consider, for example, the ordinary active bimalate of lime, and the corresponding inactive bimalate. Their chemical composition is exactly the same, and their crystalline forms are alike, with this difference that the form of the active bears four small hemihedric faces, always absent in the form of the inactive. Whence it results that placed before a glass, the image of the active cannot be superposed on it, while the image of the inactive is absolutely identical and superposable to the reality which gives

it. Excepting the hemihedric faces, there is a perfect resemblance between the two forms.

Who could doubt after that, the relations of molecular arrangements of these two salts? Is it not evident that we have here to deal with a malic acid identical to the natural, except the simple suppression of its molecular dissymmetry?

This is the natural malic acid untwisted, if I may so express it. The natural acid, in the arrangement of its atoms, is a winding stair; this one is the same stair, formed of the same steps, but straight, instead of being spiral.

It might now be asked if the new malic acid is not the paratartaric of the series, that is, the combination of the right malic acid with the left malic acid. That is scarcely probable; for then not only with an inactive body we would have made an active body, but would have made two, one right and one left.

Besides, I have ascertained that just as there exists a non-dissymmetric inactive malic acid, so there is also a non-dissymmetric inactive tartaric acid, very different from paratartaric acid, and which cannot be resolved into right tartaric and into left tartaric acids. Here it cannot be doubted that we have to deal with right or left tartaric acid rendered non-dissymmetric.

I have also discovered inactive amylic alcohol, which yields a whole series of inactive products corresponding to the series of active amylic alcohol.

Thanks to the discovery of inactive bodies, we are in possession of a fruitful idea: a substance is dissymmetric, right or left, by certain modes of isomeric transformations, which must be sought and discovered in each particular case; it may lose its molecular dissymmetry, untwist itself, to use a coarse illustration, and effect in the arrangement of its atoms a disposition with a superposable image. So that every dissymmetric substance offers four varieties, or rather four distinct subspecies: the right body, the left body, the combination of the right and the left, and the body which is neither right nor left, nor formed by the combination of the right and left.

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if natural products, organized under the influence of vegetable life, are ordinarily dissymmetric, contrarily to what mineral and artificial products offer us, this disposition of elementary particles is not a condition of existence of the molecule, that the twisted organic group can untwist itself, and then take the general character of artificial or mineral substances. On the other hand, it seems to me logical to regard the latter as susceptible of presenting a dissymmetric arrangement of their atoms in the manner of natural products. The conditions of their production are to be discovered.

As final analysis and summing up of what precedes, the groups of elementary atoms which constitute compound matter may cover two distinct states, corresponding to two general types to which every material object may be referred. The form of the group is with a superposable image, or with a non-superposable image; but this latter type is double, because its inverse can exist on the same ground as itself. We must add the case of the association of these two inverse types, which recalls the union by pairs of the identical and non-superposable members of the superior animals. So that there is in reality four remarkable dispositions for the groups of atoms which constitute matter. All our efforts should tend towards producing them for each particular species.

There is in almost all these considerations such exactitude, that it seems impossible to call them in question.

How refuse to admit that a right body has its possible left, knowing as we know the signification of the right or left character? This would be to doubt that an irregular tetrahedron has its inverse, that a dextrorse helix has its sinistrorse inverse, that a right hand has its possible left.

And hence, if the mysterious influence to which the dissymmetry of natural products is due should come to change in sense or direction, the constituting elements of all living beings would take an inverse dissymmetry. Perhaps a new world would be presented to us. Who could foresee the organization of living beings, if the cellulose, which is right, should become left, if the left albumen of the blood should become right? There are here mysteries which prepare immense labors for the future, and from this hour invite the most serious meditations of science.

VIII.

Only because chemistry has been up to the present time powerless in the preparation of dissymmetric bodies, might we fear that we may be always ignorant of the mode of production of the inverse bodies of natural organic substances. Happily this fear is exaggerated. I have ascertained indeed that, by ordinary chemical processes, such as the action of heat, a right body can be changed to its left, and inversely. Thus in warming right tartaric acid under certain determinate conditions, which it would be too long to specify here, it is transformed into left tartaric acid, or rather into paratartaric acid; and inversely, under the same conditions exactly, left tartaric acid becomes right.

Here are ten or twelve grammes* of entirely pure, left tartaric acid, which were thus procured. Their preparation cost me much trouble. But M. Biot desired to study in a very particular manner the characters of dispersion of this left tartaric acid, so remarkable on account of its origin. He desired himself to be at the cost of the operation; very expensive, because the transformation depends upon the employment of the tartrate of cinchonine or of quinine, and the base is lost because the tartrate must be heated to a temperature which destroys it.

I have prepared by this process sufficient paratartaric acid to take from it twelve grammes of left tartaric acid, which presents rigorously, in an inverse sense, the same optical characters as tartaric acid.

Every analogous transformation of a natural dissymmetric body into its inverse, should be regarded as a great advance in organic chemistry.

IX.

At the conclusion of our first lecture, I alluded to observations to which it is time we should give all the attention they merit. These observations are relative to the comparison of the physical and chemical properties of right and corresponding left isomerics. I have already insisted upon the perfect identity of all their properties, excepting, however, the inversion of their crystalline forms, and the opposition of direction of their optical deviations.

* A gramme is equal to about 15½ grs.—Tr.

Physical aspect, lustre of the crystals, solubility, specific gravity, single or double refraction, all is not only alike, similar, very near, but identical in the most rigorous acceptation of the word.

This identity is the more remarkable as we shall see it replaced by a general and considerable opposition of the properties of these same substances, when they are found in particular conditions which I am about to point out.

We have seen that we must distribute all chemical compounds, artificial or natural, mineral or organic, in two great classes; compounds non-dissymmetric with superposable image, and compounds dissymmetric with non-superposable image.

This stated, the identity of properties, of which I have just spoken in the two tartaric acids and their similar derivatives, constantly exists with the absolute characters I have named, whenever these substances are placed in presence of any compound of the class of bodies with superposable image, such as potassa, soda, ammonia, lime, barytes, aniline, alcohol, the ethers—in a word, of all compounds, whatever they may be, not dissymmetric, not hemihedric in form, without action on polarized light.

Submit them, on the contrary, to products of the second class with non-superposable image, asparagine, quinine, strychnine, brucine, albumen, sugar, &c., &c., bodies dissymmetric like them, all changes in an instant. Solubility is no longer the same. If there is combination, the crystalline form, specific gravity, the quantity of water of crystallization, the more or less ready destruction by heat, all differ as much as the most distant isomeric bodies differ.

Here then we have the molecular dissymmetry of bodies introducing itself in chemistry as a powerful modifier of chemical affinities. In presence of the two tartaric acids, quinia does not behave like potassa only because it is dissymmetric, and potassa is not. Molecular dissymmetry is hence offered as a property capable by itself, as far as dissymmetry, of modifying chemical affinities. I do not believe any discovery has yet entered so far into the mechanical part of the problem of combinations.

Let us endeavor to present the cause of these identities and of these dissemblances. Let us suppose a dextrorse helix and a sinistrorse helix separately penetrating two blocks of identi-

cal wood, and in right lines. All the mechanical conditions of the two systems will be the same. It will be no longer so from the moment these same helices shall be associated with blocks, themselves shaped in helices of the same direction, or of opposite directions.

X.

Here is a very interesting application of the facts which I have just submitted.

Seeing right and left tartaric acids become thus dissimilar solely in virtue of the rotary power of the base, there was room to hope that from this very dissemblance would result chemical forces capable of balancing the mutual affinity of these two acids, and consequently a chemical means of separating the two elements of paratartaric acid. I long sought without success; but I succeeded in it by the aid of two new bases, isomerics of quinine and cinchonine, and I obtain very easily without the smallest loss, by the aid of these latter, quinicine and cinchonicine.

I prepare the paratartrate of cinchonicine by neutralizing the base, then adding as much acid as was required for its neutralization, I crystallized, and the first crystallizations are formed of left tartrate of cinchonicine perfectly pure. All the right tartrate remains in the liquid because it is more soluble. Then itself is crystallized, and under a different aspect, because it has not the same crystalline form as the right [qu. left?] One would suppose that he had to deal with the crystallization of two very distinct salts, of unequal solubility.

XI.

But the dissemblance of the properties of corresponding right and left bodies when submitted to dissymmetric forces, appears to me to be of the highest interest, in connection with the ideas it suggests on the mysterious cause, which presides over the dissymmetric disposition of atoms in natural organic substances. Why this dissymmetry? why such a dissymmetry in preference to its inverse?

Recur with me in thought to the epoch when, having recognised the absolute identity of the physical and chemical properties of corresponding right and left bodies, I had no idea, not

even a suspicion, of possible differences between these bodies. It is, indeed, many years since I recognised these identities and these differences.

It was then impossible for me to understand how nature could make a right body, without making at the same time a left body. For the same forces which are in play at the moment of the elaboration of the molecule of right tartaric acid, ought, it seems, to give a left molecule, and there should be only *paratartarics*.

Why even rights or lefts? Why not, only non-dissymmetrics, substances of the order of those of inorganic nature?

There are evidently causes for these curious manifestations of the play of molecular forces. To indicate them in a precise manner, would be certainly very difficult. But I do not believe I am mistaken in saying that we know one of their essential characters. Is it not necessary and sufficient to admit that, at the moment of the elaboration in the vegetable organism of immediate principles, a dissymmetric force is present? For we have just seen there was but a single case in which the right molecules differed from their left, the case in which they are submitted to actions of a dissymmetric order.

May these dissymmetric actions, placed perhaps under cosmic influences, reside in light, in electricity, in magnetism, in heat? Are they in relation with the motion of the earth, with the electric currents by which physicists explain the terrestrial magnetic poles? It is not even possible, at the present time, to emit the smallest conjectures in this respect.

But I regard as necessary the conclusion, that dissymmetric forces exist at the moment of elaboration of natural organic products, forces which would be absent or without effect in the re-actions of our laboratories, either on account of the sudden action of these phenomena, or on account of some other unknown circumstance.

XII.

We come to the last experiment, the interest of which does not yield to any of those which precede, in the proof which it will manifestly afford us of the influence of dissymmetry on the phenomena of life. We have just seen dissymmetry intervene as a modifier of chemical affinities; but it dealt with re-actions

purely mineral, artificial, and we all know how prudent we should be in the application of results in our laboratories to the phenomena of life. Therefore I have reserved almost all the views presented in this lecture until I recognised in the most certain manner, that molecular dissymmetry offers itself as a modifier of chemical affinities, not only in the re-actions of inorganic nature, but in those of a physiological order, in fermentations.

This is the remarkable phenomenon to which I allude.

It has long been known, through the observation of a manufacturer of chemical products in Germany, that the impure tartrate of lime of the factories, soiled by organic matters, and abandoned under water in the spring, may ferment and yield different products.

That stated, I place in fermentation the common right tartrate of ammonia in the following manner:—I take the very pure crystallized salt, dissolve it, adding to the liquid a very limpid solution of albumenoid matters. One gramme of dry albumenoid matters is enough for 100 grammes of tartrate. Very often the liquid, placed in a stove, spontaneously ferments: I say very often; I might add, that it always takes place, if care is taken to mix with the liquid a very small quantity of one of those liquids in which spontaneous fermentation has been obtained.

Thus far there is nothing remarkable; it is a tartrate which ferments. The fact is known.

But apply this mode of fermentation to the paratartrate of ammonia; and, in the preceding conditions, it ferments. The same yeast, or leaven, is deposited. All indicates that things go on absolutely, as in the case of the right tartrate. If, however, we follow the steps of the operation with the aid of the polarizing apparatus, we very soon perceive marked differences between the two operations. The liquid, at first inactive, possesses a rotary power sensibly to the left, which augments little by little, and attains a maximum. Then the fermentation is suspended. There is no longer a trace of right acid in the liquid, which, evaporated and mixed with its volume of alcohol, immediately furnishes a fine crystallization of left tartrate of ammonia.

We remark at first in this phenomenon two distinct things; as

in every fermentation, properly so called, there is a substance which is chemically transformed, and correlatively, there is a development of a body possessing the manners of a mycodermic vegetable. Elsewhere, and it is this which it is important to note at this time, the yeast which causes the right salt to ferment, respects the left salt, in spite of the absolute identity of the physical and chemical properties of the two right and left tartrates of ammonia, whenever they are not subjected to dissymmetric actions.

Observe then molecular dissymmetry proper to organic matters intervening in a phenomenon of the physiological order, and it intervenes here in its character of modifier of chemical affinities. There is not the least doubt in the world about what may be the kind of dissymmetry proper to the molecular arrangement of left tartaric acid, which is the sole, exclusive cause of the difference that it presents with the right acid, under the relation of its fermentation.

And thus is found introduced into physiological considerations and studies the idea of the influence of the molecular dissymmetry of natural organic products, of the great character which establishes, perhaps, the only well-marked line of demarcation, which can be placed at the present time between the chemistry of organic nature and the chemistry of inorganic nature.

XIII.

Such are, gentlemen, in their totality, the labors with which I have been charged to entertain you.

You have learned, as we advanced, why I have entitled my exposition, On the Molecular Dissymmetry of Natural Organic products. It is, in fact, the theory of molecular dissymmetry that we have just established; one of the highest chapters of science, entirely unforeseen, and which offers to physiology entirely new, distant, but certain horizons.

I entertain this opinion of the results of my own researches, without mingling in the expression of my thought any of the self-satisfaction of the author. May it please God that personalities shall never be possible in this chair! These are as pages of the history of chemistry, which we shall successively write, with the sentiment of dignity which a true love of science always inspires.

ON A SPURIOUS EXTRACT OF JALAP.

By Charles Bullock.

At our pharmaceutical meeting in October last, the President, Charles Ellis, called attention to a specimen on the table purporting to be extract of jalap. The sample was part of a lot then offering in considerable quantities in the New York market. A partial examination of the extract having shown that it was sophisticated, Edward Parrish and myself were appointed to make a further examination to ascertain its character.

Preparatory to our remarks on the sample under examination, we give a sketch of the general characteristics of the active cathartic resins usually found in the shop, viz: those of Jalap. Scammony, Podophyllum, and Gamboge, hoping it may be of interest in connexion with our subject.

RESIN OF JALAP.

The alcoholic extract of jalap consists of two resins; one soluble in ether, and the other insoluble in that menstruum. The medicinal quality of jalap resides in the hard resin, which is insoluble in ether. To this resin Mr. Kayser has given the name of "Rhodeoretine," and attributes to it the formula $C_{42} H_{35} O_{20}$. In uniting with bases it fixes one equivalent of water, and becomes a feeble acid called "Rhodeoretinic acid." Soluble in water and alcohol, insoluble in ether, and has a bitter taste.—(Pelouze and Fremy.)

Rhodeoretinic acid is not precipitated from its combination with potash by the stronger acids, on account of its solubility in water.

The alcoholic solution of the hard resin (Rhodeoretine) treated with chlorohydric acid changes the resin into a liquid substance called "Rhodeoretinol" having the formula $C_{30} H_{23} O_4$. In the reaction glucose is also formed. Rhodeoretinic acid gives the same result with chlorohydric acid.—(Pelouze and Fremy.)

There exists in commerce another species of jalap (?) which affords a resin particularly acid, soluble in ether, inodorous, insipid, brittle and fusible. This resin has received the name of para-rhodeoretine, and has for its formula $C_{42} H_{34} O_{18}$.—(Pelouze & Fremy.)

Rhodeoretine (the hard resin) has the following reactions with reagents:

In Caustic Alkalies.—Very soluble and not precipitated on addition of a stronger acid.

In Carbonated Alkalies.—Sparingly soluble and only after long digestion.

In Acetic Acid.—Very soluble, (Pelouze & Fremy.) [Requires warm glacial acetic acid to dissolve it.]—

Sulphuric Acid.—Concentrated sulphuric acid colors the resin a carmine red.—(P. & F.)

Nitric Acid, of 35° B. when warm, dissolves the resin freely.

In Chloroform it softens, but does not dissolve.

In pure Benzole it is insoluble.

RESIN OF PODOPHYLLUM.

Podophyllum root, like jalap, contains two resins, one soluble and the other insoluble in ether.

There appears to be a diversity of sentiment as to which of the two resins the activity of the root is attributable.

Mr. J. R. Lewis, (Jour. of Pharm. vol. xix. p. 165,) says, both resins were found to possess the active properties of the root.

Mr. Cadbury (Jour. Pharm. vol. xxx. p. 401) found the ethereal resin the most active. The same conclusion is arrived at by Mr. H. Allen, (Jour. Pharm. vol. xxxi.) while Mr. W. G. Parrish considers the ethereal resin the least active.—(Jour. Pharm. vol. xxxii.)

The following experiments were made with Podophyllin manufactured by W. S. Merrill & Co. of Cincinnati. Ether extracted 63 per cent. Mr. Cadbury found 77 per cent. soluble in ether. The amount of resin soluble in ether appears to vary with the season in which the root is collected. Some experiments detailed in the "American Journal of Materia Medica," for 1859, give 54·34 per cent. as the proportion of resin soluble in ether in Podophyllin made from the root collected in the spring, and 39·95 per cent. from podophyllin made from the autumnal root.

The Alcoholic Resin.

The resin insoluble in ether has a dark olive green color.

Its taste is slightly bitter, with little or no acrimony, and with but little odor. When heated it intumesces without fusing.

In *Caustic Alkalies* it is soluble, and is precipitated by an acid added to excess.

In *Carbonated Alkalies* it dissolves to a considerable extent in the cold; a moderate heat promotes its solution.

In *Ammonia* the resin is soluble to a considerable extent.

Chloroform does not dissolve nor soften the resin.

Pure Benzole has no action on the resin.

Nitric Acid, 35° B. cold, dissolves the resin, forming a deep red colored solution.

In *Acetic Acid*, No. 8, the resin is nearly insoluble.

Warm glacial acetic acid dissolves it freely.

The Ethereal Resin.

Umber color, furnishing an ochrey yellow powder.

This resin possesses the peculiar odor of the root, is slightly bitter and acrid. It fuses at about 240° F.

In *Caustic Alkalies* it is soluble, but less freely than the other resin; the solution is precipitated by acids in excess.

In *Carbonated Alkalies* soluble to a considerable extent; heat promotes the solution.

In *Chloroform* very sparingly soluble.

In *Pure Benzole* insoluble.

Nitric Acid, 35° B. cold, forms an imperfect solution of a red color.

Sulphuric Acid, concentrated, dissolves the resin, forming a deep red solution, yellow on the sides of the glass.

Acetic Acid, glacial, dissolves this resin, but not so freely as the alcoholic resin.

RESIN OF SCAMMONY.

By the action of caustic alkalies, resin of scammony is converted into scammonic acid. This acid being soluble in water, the alkaline solution of the resin is not disturbed by addition of an acid to slight excess.

The resin of scammony of Messrs. McAndrew affords a precipitate when its alkaline solution is neutralized by a mineral acid. This reaction would indicate the presence of some resin

other than that of scammony. As the resin of Messrs. McAndrew is not a resin from exudation, but prepared by maceration of the root in alcohol and precipitation by water, it may account for the presence of a resin other than that usually recognised as pure resin of scammony.

In *Acids.*—Warm nitric acid of 35° B. dissolves the resin imperfectly.

In *Chloroform*—Very soluble.

In *Alcohol and Ether*—Soluble.

In *pure Benzole*—Insoluble.

In *Aqua-ammonia.*—Soubeiran states that the resin dissolves in the menstruum, the solution having a beautiful green color.

The pure resin is very sparingly soluble in ammonia, and only after long standing. The presence of some copper salt derived from the vessels used may perhaps account for the green color; the partial solution of the resin being yellow, a combination with the blue of the copper salt would afford a green color.

The resin of scammony fuses at 142° C. [351·5° F.] and has the formula $C_{40}\ H_{66}\ O_{20}$.—(Pelouze & Fremy)

RESIN OF GAMBOGE.

The resin of gamboge has decided acid properties. Its combinations with the alkalies are red, and separate like soaps on the addition of chloride of sodium. The formula of the resin according to Büchner, is $C_{60}H_{35}O_{12}$. The gum which accompanies the resin has, according to Büchner, the same composition as starch.—(Pelouze & Fremy.)

Nitric acid 35° B. when hot, decolorizes the resin, leaving it crisp and friable.

In *Ether and Alcohol*—Soluble.

In *Chloroform*—Very soluble.

In *pure Benzole*—Very soluble. [Pure benzole dissolves nearly its own weight of alcoholic resin of gamboge.]

EXAMINATION OF SOPHISTICATED EXTRACT OF JALAP.

Color, not as dark as extract of jalap; when pulled, becomes yellow on the edges. Odor deficient.

Taste—Very slightly bitter and not acrimonious.

Strong Alcohol extracted 69 per cent. of soluble matter.

Ether dissolved 34 out of the 69 per cent. of alcoholic extract.

That part of the alcoholic extract not soluble in ether, is a soft resin, soluble in caustic potash, and is precipitated by acids in excess.

Acetic Acid dissolved the resin, forming a muddy yellow solution.

Sulphuric Acid, concentrated, chars and dissolves the resin.

Nitric Acid, 35° B., when cold, forms with the resin a turbid yellow solution.

The ethereal resin has a red color, yellow on the edges.

Caustic Alkalies dissolve the resin freely, forming a red solution.

Nitric Acid, 35° B. when hot, decolorizes the resin, rendering it crisp and friable.

Chloroform dissolves the resin freely, forming a light yellow solution.

Pure Benzole dissolves the resin freely, forming a light yellow solution.

When chloride of sodium is added to the alkaline solution of the resin and heated, the resin separates entirely.

The extract contains 8 per cent. of inorganic matter, which effervesces on addition of acid.

The hard or active resin of Jalap is distinguished from the other resins we have considered, by not being precipitated from its combination with the caustic alkalies, when acid in excess is added.

Podophyllin differs from the other resins, by its solubility in the carbonated alkalies, and by dissolving in cold nitric acid of 35° B. forming a deep red solution.

Resin of Scammony is insoluble in benzole, but soluble in chloroform, thus differing from jalap and podophyllin which are insoluble in chloroform.

Resin of Gamboge differs from all the other resins by its ready solubility in pure benzole, and separating from its alkaline combination on addition of chloride of sodium.

From these experiments we deduce the conclusion that the extract under examination owes its medicinal qualities to 34 per cent. of resin of gamboge, equivalent to 42 per cent. of gamboge contained in it, and contains no resin of jalap or podophyllin.

Philadelphia, January, 1862.

REMARKS ON THE ANALYSIS OF BRANDY.

By Samuel P. Duffield, Ph. D.

To the Editor of the American Journal of Pharmacy:

Dear Sir,—As a desire was expressed by the Committee appointed for the Revision of the Pharmacopœia, that there should be free contributions from all members, to that end, on the topics most suited to their tastes, or on those subjects in which they had had more than ordinary experience, I trust that it may not seem out of place for me to tender an article on the subject of "Pure Brandy," the "Spiritus Vini Gallici" of our National Dispensatory. When introduced by that work as a remedial agent, reference was had to *distilled wine*, not to a factitious compound, which has now almost the sole occupancy of our market.

For the past four years I have made analyses of liquors in those cases in which they came, on my order for my stock for dispensing, &c. On these orders I always distinctly stipulated that they should be pure articles.

I ordered from New York and Philadelphia importers, feeling assured that if I dealt directly with houses of highest note in commerce, I would be very likely to find the pure article in question. To my utter astonishment every one proved to be manufactured, either in this country or abroad. I subjected the articles to their order.

At last, despairing of ever being able to procure any article suitable to use as a remedial agent, and having actually lost faith in the chemical reagents, (for not a single sample proved, when tested by them, to be genuine), I thought, before accusing importing firms any more, I would prove the truth or fallacy of Normandy and Hassal's experience. My father had manufactured some wine from Isabella grapes, which grew around our piazza, and he gave me a bottle (at that time two years of age) to experiment with. I distilled from one pint of wine four fluid ounces, and as the distillate began to lose in alcoholic strength, stopped at that quantity. The distillate was clear as distilled water, with more marked ethereal odor than any commercial article I had met with. On subjecting it to "Gay Lussac's dry distillation," "Molnar's test," and "Kent's sulphuric

acid test," it remained unchanged, proving the absence of grape fusel oil, with which the *marc* brandies are loaded. Here was evident proof that Chevallier, Accum, Normandy, Hassal and Mitchell were correct in their experiences, and that the tests given were reliable.

Shortly after this I was written to by a New York house, whose brandy I sent back, to give them my system of analysis, in order that they could test its accuracy, by practical application, in their own hands. About two weeks after, I received a letter stating "they had subjected the article I refused to the analytical process furnished them, and *all was right, except it lost the 'bouquet,'*" and he asks, "where can this 'bouquet' have gone to; it is neither in the contents of the retort, nor in the distillate." In that very sentence he branded his article impure. As I held out to have pure and attested articles, I was constantly applied to to furnish pure brandy, but could not, for upwards of two years, meet this demand.

Mr. Charles Carpenter came into my laboratory while experimenting on the most economical method of preparing oil of wine, and showed me a sample of what he stated was pure brandy. I subjected it to analysis and found it to be of similar character with that manufactured by Zimmerman & Co., though freer from grain oils than the sample analyzed by Mr. E. S. Wayne and described in one of the back numbers of your valuable Journal. I described to him what I desired, and he said he had been to Cincinnati, and there was nothing there but *marc* brandy, and I would seek in vain for distilled wine in the United States.

After an explanation of the process, he agreed to distill me twenty gallons as a trial. I send you herewith a sample, and desire, if you feel so disposed and have the time, to subject it to all the tests known to chemists. The article in question is distilled from *Catawba wine* of three or four years of age, and could be furnished at twelve dollars the gallon. We retail it at sixteen the gallon, paying the price above for it, and give one ounce for the same rate, (one shilling.) Of course there is not the same amount of profit which could be secured by the sale of common "Rochelle" at four and six dollars per gallon, but I trust that the majority of apothecaries of the Philadelphia

school have a higher aim than illegal gain. The apothecary should be qualified to test all his articles, both chemically and microscopically, and then we would have a different class of articles passing through the hands of the wholesale jobbing houses, for they would have to supply the demand or fall.

The system of analysis I would suggest as simple and adequate to the apothecary's wants on the subject, would comprise five divisions:

1st. Per centage of alcohol.

2d. The quality and origin of liquor used as the base of the factitious brandy.

3d. Detection of bitter almond oil, almond cake, and cherry laurel water.

4th. Detection of aromatics.

5th. Detection of mineral poisons.

1*st. Percentage of Alcohol.*

Take of the suspected brandy a pint, introduce it into a tubulated retort, and distill eleven fluid ounces.

Take the specific gravity of the liquid distilled, and from the tables under the head of alcohol in the U. S. Dispensatory, find the percentage of alcohol; reserve both the distillate and the residuum in the retort for *further tests.*

2*d. The quality and origin of the liquor used as* THE BASE OF THE FICTITIOUS BRANDY.

I would suggest that "Molnar's Test," (transactions of the Am. Pharm. Association of 1858, or 59,) be used for this purpose. It is also given in the Annual of Scientific Discovery, in one of those years. In connection also employ "Gay Lussac's dry distillation process. As most of your readers may not be conversant with the process, I give it below in full.

About two ounces of the suspected brandy is mixed to the consistence of a thick mortar, with powdered fused carb. potassa. The vino-ethereal odor will be unimpaired if the specimen was pure. If not, the peculiar odor of the liquor forming the base of the article will be brought out *clearly.*

3d. *Detection of Bitter Almond Oil, Almond Cake and Cherry Laurel Water.*

Should either of these be sought for, the pharmaceutist takes the distillate obtained in process, *first*, for the purpose of estimating percentage of the alcohol, and adds to it a small amount of caustic potassa solution, enough to give it a distinctly alkaline reaction, and evaporates to a small bulk. To this liquid add a few drops of a solution containing a mixture of proto- and sesquisulphate of iron, add now hydrochloric acid, to a decided acid reaction. If the liquid assumes a blue tint, the brandy has been flavored with cherry laurel water, oil of bitter almonds, or almond cake. To those who desire a still more delicate reaction, the "Liebig sulpho-cyanide test" is recommended.

To the distillate obtained in the first process as above, caustic potassa solution is added, the bulk of spirit reduced as before, by evaporation on a water bath. Hydrochloric acid is added to an acid reaction, and then a few drops of sulphide of ammonia solution (NH_4S+HS,) and the whole heated until colorless.

If now perchloride of iron solution be added (a few drops only,) the liquid assumes a blood red color if prussic acid or its compounds were present.

4th. *Detection of aromatics and acid substances.*

The residual liquor in the retort is evaporated to the consistency of simple syrup, and the taste will generally detect their presence.

Pure brandy should leave no such substances as a residuum.

5th. *Detection of the metals.*

For the method of detecting these, ample directions are given under their individual names in our national Dispensatory. In addition to Gay Lussac's and Molnar's test, that of Prof. E. Kent of New York, by concentrated sulphuric acid, can be used.

Detroit, Mich., Jan. 10th, 1862.

NOTE ON THE BARTRAM OAK (QUERCUS HETEROPHYLLA.)

By S. B. Buckley.

The Bartram Oak (Quercus heterophylla, *Mx.*) has long been regarded by most American Botanists as a hybrid. Accompanied by Mr. Procter, Editor of the Journal of Pharmacy, I lately went to Mount Holly, near Burlington, in New Jersey, to see an oak with leaves of varied forms, many of which correspond in shape with the figure of the Bartram Oak in Michaux's Sylva. It is less than one-fourth of a mile from the depot at Mount Holly,* in a thicket near several willow oaks (Quercus phellos), of which it is plainly one. It has all the characteristics of body, limbs and acorns, peculiar to the willow oak. Many of its leaves have the ordinary form of Quercus phellos. Michaux, in his description of the Q. heterophylla, says that several young plants of the Bartram Oak have been placed in the public gardens to insure the preservation of the species. One of these, which was grown from an acorn of the original Bartram Oak, was planted in the Bartram Garden. Col. Carr, who succeeded Bartram in the ownership and possession of the garden, showed this tree to Mr. Meehan of Germantown, who had charge of the Garden during two years. With Mr. Meehan, a few days since, I visited this tree. It also is a Quercus phellos. It has very few lobed leaves; indeed there is scarcely one in fifty of them lobed.

In Mr. Durand's herbarium are specimens of Quercus phellos with lobed leaves like the Bartram Oak, which he received from Columbia County in this State, where such forms of the willow oak are said to be quite common along the banks of the Susquehanna. The Bartram Oak is not a hybrid, but a mere form of Quercus phellos, which, like most American oaks, varies greatly in the shape of its leaves.

Since writing the above I have seen a specimen from the original Bartram Oak, which has both lobed and entire leaves, showing beyond question that it is a form of Q. phellos. This specimen is now in the general herbarium of the Academy of Natural Sciences at Philadelphia.—*Proc. Acad. Nat. Sci. Phila.*

After the preceding was placed in the hands of the printer,

* On the farm of Mr. William Rossell.

I saw a young oak in the grounds of Joshua Hoopes, at West Chester, Pa., which was grown from an acorn obtained from a tree in the Marshall Garden, a few miles from West Chester, which was raised from a scion or acorn of the original Bartram Oak. The Hoopes tree is about fifteen feet high and three inches in diameter. It has all its leaves lobed, and in foliage has no resemblance to the willow oak. This may arise in part from its young and vigorous growth, there being often a tendency in young trees to have different foliage from what they wear at maturity; however, this is not often the case with the willow oak. Mr. Hoopes told me that most of the leaves of the Marshall tree were also lobed. Should these trees maintain their characteristics and be propagated, the Bartram oak may become an example of the formation of a new species from a form of an old species.

That new species are being constantly made slowly and gradually, is believed by many botanists, yet the shortness of human life, and our limited observations, prevent us from seeing and proving it.

It is desirable that the trees alluded to should be preserved and propagated to test the question for the satisfaction of future enquirers.

Now the Bartram Oak is a variety of Quercus phellos, but time may cause it to be a good species.

ON COMMERCIAL BELLADONNA LEAVES.

By J. M. Maisch.

Atropa belladonna, Linn. grows in the greater part of Europe in moist woods. Besides the root, the leaves are of great importance as medicinal agents, and, as far as my observation reaches, much more frequently employed in this country than the root. The chief pharmaceutical preparations for which they are used, are the tincture and the extract, a considerable quantity of the latter being manufactured here on the large scale, and the consumption of the by far largest portion of the imported leaves is undoubtedly for this latter purpose.

Belladonna leaves are imported into this country chiefly, if

not exclusively, from England and Germany. The former, as we learn from discussions before the London Pharmaceutical Society, in consequence of a paper by P. Squire, "On Medicinal Extracts," (Pharm. Jour. and Trans. iii. 300—308,) are perhaps solely derived from plants cultivated for this purpose and for the manufacture of the extract. True English belladonna I have always seen imported in wide-mouth bottles, holding one pound or more. They are generally of a lively green color, intermixed with none or but few leaves having a brownish tinge; frequently they are broken, but occasionally I have observed the great bulk of the leaves entire and but little broken. The appearance of the leaves indicates that they have been very rapidly dried, most likely by artificial heat, because only by rapidly conducting this process can the color of the leaves be preserved of a pure green, while by prolonging it the upper surface will invariably assume a brownish green or even a greenish brown shade. This change of color alone does not impair the medicinal virtues, unless the leaves have, while drying, through gross carelessness, been heated spontaneously to such a degree as to darken the upper surface to a dull brown, devoid of any tinge of green, and to change the greyish green of the lower surface to a lighter or deeper brown. As far as the color is concerned, then, the leaves ought not to be deeper colored than merely brownish green above and greyish green beneath.

In Germany, where I believe belladonna is not cultivated, but gathered from the wild growing indigenous plants, it would be almost impossible to dry them, as in England, by artificial heat, and it can for this reason be scarcely expected to obtain German belladonna in large quantities of the pleasant color of the English leaves. Indeed, German belladonna, as it comes to the American market, bears by its physical properties evidence of having been dried without the application of artificial heat; it is usually imported in bales of various weight.

I have frequently heard that German herbs and extracts, as a general rule, bear no good reputation in the United States, and German narcotic extracts which I have occasionally observed, were certainly much below even very moderate requirements. Whoever has looked into the apothecary stores in Germany, and into the German stores, the smallest ones perhaps excepted,

in our large cities, which generally keep German herbs and pharmaceutical preparations, must acknowledge that excellent herbs, &c. can be obtained from Germany as well as from other countries. But there appears to be a certain class of drug exporters in Germany who consider anything good enough for the American market; and of importers in this country, who buy an article, no matter of what quality, provided it is cheap and labelled like the best one. In confirmation of this statement, I need but refer to the controversy in some German journals, a short time ago, between large distillers of volatile oils, when one firm frankly acknowledges that the oleum carui ex stipit. noted in their price lists, was not what it pretended to be, the oil distilled from the chaff and stalks, (Kümmelspreu,) but distilled from the same with the addition of oil of turpentine, and that it was prepared solely for the foreign (American) market; thus it is that a pound of so-called oil of caraway may be bought here at the price of about an ounce of the true oil.

If there were no buyers here for such adulterated stuff, the manufacturers and exporters in Europe would soon find it an unpaying business; as long, however, as they can profitably dispose of their sophisticated articles, it would be folly to expect them to give up their most honorable traffic. The appointment, some years ago, of drug inspectors at the various ports of importation, was hailed as a progress by all right-minded men, and as the surest means for preventing our market from being overflown by worthless merchandize. But the prostitution of this office for political purposes is the surest way to counteract the good intentions of the law. In the following I propose to show the quality of some parcels of belladonna, and we may well wonder how it was possible that some of these bales could have passed the examination of the so-called drug inspector.

A short description of the leaves in question may precede the investigation. Belladonna leaves ought to be gathered during the months of June and July, while the plant is in blossom, and before the top flowers have fully expanded. The leaves are arranged alternate, usually two growing from the same place, of which one remains small; their shape is ovate-lanceolate, pointed, tapering into the margined petiole, or the uppermost sessile, with the margin entire; they are smooth and dark green above, lighter

green beneath and glandular hairy on the veins and petioles. On drying they become very thin, and appear semi-transparent when held up to the light; their color in the dry state has been mentioned above.

Dr. E. R. Squibb, of Brooklyn, a few weeks ago, met with a bale of German belladonna, which he found largely adulterated with fragments of the leaves of digitalis; he very kindly furnished me with a sample of the same. Comparatively few of the belladonna leaves present the characteristics of having been carefully dried; many are dark colored and even nearly black. From these the broken leaves of Digitalis purpurea, Linn., are readily distinguished by their different color, the soft white hairs, the net of prominent white veins, and the purplish midrib on the lower side. On closer examination, I detected some leaves of Solanum nigrum, Linn., known by their ovate shape and sinuate toothed margin, of Solanum villosum, Willd., resembling the former, but villose on both sides, and the upper end of a twig, the leaves of which are somewhat crowded, much perforated by insect bites, and of a rather thicker texture and smaller size than belladonna leaves, but otherwise resembling them in shape. The latter I take to be those of Atropa belladonna, as well as some fragments of withered brownish yellow leaves, the base of which is less attenuate and inclines more to oval oblong. They might, however, belong to Scopolia atropoides, Schultes, which Professor Wiggers (Pharmacognosie, page 273) states are apt to be confounded with belladona leaves, and which are described as petiolate, oval oblong, smooth, entire, and somewhat rugose; I am not acquainted with this latter plant, that grows in south eastern Germany, Hungary, Croatia, &c. A very few branches of moss might be overlooked as accidental impurities. Among the finer portion of the leaves, I found some flowers and fully developed fruits of belladonna, small leafy portions covered with a dense wool, probably from Verbascum thapsus, Linn., calyces of a labiatous plant, nearly pentagonal, regularly and sharply five-toothed, ten-ribbed and containing brown, slightly netted-veined nutlets; also some sections of a longitudinally wrinkled, dead herbaceous stem.

The barefacedness with which such an article had been put up for exportation, the faithful simplicity and happy ignorance

with which it was offered to a careful and conscientious man, are fit subjects for serious contemplation. How did this German belladonna get to New York? Did it really pass the custom house? And had it been examined by the drug inspector? Any how, it was labelled belladonna and it contained some. The matter, however, is too serious to be treated lightly, and it seemed to me interesting to examine other specimens of belladonna leaves.

The next lot which I was fortunate enough to fall in with presented another kind of adulteration, so apparent in its character that it is difficult to conceive how an apothecary of the most ordinary attainments can sell it. About 25 per cent., I should judge, consist of portions of the stem, leaves and fully developed capsules of Hyoscyamus niger, Linn. An accidental admixture of these to belladonna is not possible, from the fact that both had been evidently mixed while drying, and were folded around each other. The greatest part of the leaves were so much broken as to prevent their identification; but among this finer portion I found some fruits of Malva rotundifolia, Linn., a few small syngenesious flowers, and the shrivelled half-expanded flowers with a short corolla and included stamens, about the size of belladonna flowers, but quite distinct from them.

A third sample, apparently likewise of German origin, consisted of true belladonna leaves, which were, however, gathered at an improper season. None of the leaves exceeded two inches in length; a great many measured between half and one inch, and were partly still attached to the slender tops of the branches. They were collected before flowering, and their active principles were therefore not fully developed; for Professor Schroff has demonstrated that the leaves as well as the root are most active in July, during the period of flowering; otherwise the leaves were unobjectionable, being entirely free from any impurities whatever.

Upon application, Messrs. John & Cramer, of Philadelphia, kindly sent me a sample of their belladonna, which had been collected on the Niederwald near Wiesbaden, Germany, and was imported from Edmund Hardy, in Mayence. This is an excellent specimen, consisting solely of leaves, measuring besides the petiole from two to four inches, and having all the char-

acters of vigorous belladonna leaves, which evidently have been dried with great care, the lower surface being of a bright cinereous green and the upper surface of a green color, sometimes with a slight brownish tinge, and but rarely of a deeper brownish green; they possess the slight odor and the insipid somewhat bitterish acrid taste of well dried belladonna leaves. No stems, flowers or fruits of the belladonna are found in it, and the most careful examination showed likewise the absence of all other vegetable products. The sample is equal in every respect to any derived from England, and superior to many that I have seen, because there is scarcely a broken leaf among them, so that each one may be individually examined from the base of the petiole to the apex of the blade.

I had occasion to examine a package of German belladonna, which is put up similar to the packages of the Shakers, only longer and broader and less in thickness; it was marked as follows: Actien-Gesellschaft für Fabrikation comprimirter Gemüse in Frankfurt-am-Main. Folia Belladonnæ "Warnecke's" Patent in England. It contains besides the leaves, portions of the stems or branches, some berries and a few flowers of belladonna. The whole had been well dried, and the care taken with this process and with the packing and cutting was evident; the absence of any foreign intermixture speaks likewise well for the selection of the proper herbs. But the presence of other portions of the plant and of some decayed belladonna leaves exclude these packages from the use for preparations of our Pharmacopœia, which directs the leaves only. Although it may be inferred from the above mentioned discussion in the London Pharmaceutical Society that the soft parts of the plant, *together* with the flowers and fruit, yield an extract stronger than that of the leaves, still it must be remembered that the plants were collected in September and had been kept back in growth by severe frosts in the spring. Schroff states distinctly that after July the strength of the leaves is diminished, and in the fall they are nearly inactive. It is well known that the fruit is extremely poisonous, and the reliability of most English extracts is probably in part due to the use of the fruit in preparing it. Is such a deviation from the Pharmacopœia, in fact from nearly all Pharmacopœias, warranted? I think not. A deviation in one instance will be the cause of others; why then have a Pharmacopœia? The proper

way, certainly, is to await the experiments of different physiologists, not only with cultivated plants, but chiefly with the wild growing; in the mean-time, as long as our Pharmacopœia recognizes the leaves only as officinal, the stems, flowers and fruits ought to be rejected. The above package contained 79·5 per cent. of leaves with the petioles, 7·5 per cent. of stems and branches, 1·9 per cent. of flowers, 4.1 per cent. of fruit and 7 per cent. of decayed belladonna leaves.

Besides the above different lots, I have examined a package of compressed belladonna leaves from New Lebanon, the general appearance of which was pretty good; the compression, however, had been carried to such an extent that the larger leaves were mostly broken, and some smaller ones only, measuring half to one inch, could be separated entire by soaking in water and carefully unfolding them. The base and apex of a number of leaves were found, indicating by their size and shape that the whole leaves rarely exceed two inches in length, thus apparently justifying the conclusion that the leaves had been either gathered rather early in the season, or that probably the cultivated plant in America does not attain the size of belladonna growing wild in those countries where it is indigenous. Moreover the prepossession against cultivated narcotic herbs has not been refuted by comparative chemical analysis, that I am aware of. This package of American-grown belladonna leaves contained none of the thicker portions of the stem and branches, and but few of the most tender tops of the latter, in no case exceeding one inch; flowers and fruit could not be detected in a half-pound package.

The results of the above investigations clearly demonstrate the necessity for every pharmaceutist to select belladonna leaves and probably other narcotic herbs with the greatest care. But if such adulterated articles cannot be sold to the dispensing pharmaceutist, is it not likely that they will be worked up into extracts which in many instances will defy all examination? It is certain that under our present laws the importation of spurious drugs is not prevented, and it would appear to be the interest of the medical as well as the pharmaceutical profession to consider the manner in which such an evil can be remedied.

New York, January, 1862.

VOLUMETRIC ANALYSIS OF PREPARATIONS CONTAINING PRUSSIC ACID, OIL OF BITTER ALMONDS, &c.

By W. H. Pile, M. D.

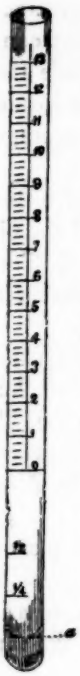
Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, January 7th, 1862.

Owing to the minute quantity of prussic acid in the distilled waters containing that substance, it requires great nicety in ascertaining the percentage strength, by the usual method of precipitating by nitrate of silver, and drying and weighing the resulting cyanide; manipulations which likewise occupy considerable time.

Liebig, to whom science is so much indebted, devised an exceedingly ingenious plan for the same purpose, which is unexceptionable in point of accuracy. But as measuring is much more rapidly performed than weighing, it occurred to me to reduce Liebig's process to a volumetric analysis, and thus put it in the power of the pharmaceutist to ascertain speedily and satisfactorily the medicinal value of several remedial preparations, which not unfrequently he is called upon to dispense, and which, unfortunately, will be found in too many instances either entirely inert or most sadly deteriorated in efficiency.

For this purpose I prepared a test solution of nitrate of silver of such strength, that for every measure of it employed in the analysis, a quantity of prussic acid would be indicated, showing the proportion of one-tenth of one per cent in any liquid under examination, and as less than one-tenth of a measure of the test solution occasions a perceptible change in the appearance of the liquid, a difference of one grain in ten thousand is thus readily detected.

The rationale of the process is as follows: prussic acid when combined with potassa, forming cyanide of potassium, has the property of rapidly dissolving freshly precipitated cyanide of silver, in such quantity that one grain of anhydrous prussic acid combined as above, will hold in solution all the cyanide thrown down from 3·148 grains of nitrate of silver, and forming with it the soluble double cyanide of silver and potassium. Now if more than that quantity of silver be added, the excess being precipitated as oxide, and remaining undissolved, renders the liquid turbid. The quantity of the test solution employed is thus easily determined, and the amount of prussic acid directly indicated.



The *test solution* which I have referred to, is simply a solution of nitrate of silver, made by dissolving 40 grains of pure fused nitrate in 2373 grains of distilled water.

Description of the test tube.—This tube, which is represented in the figure, is about half an inch inside diameter, and 12 inches long, is closed at one end and finished at the other with a thin edge and without a lip, so as to be securely closed with the thumb. The graduations are made by weighing off distilled water in successive portions. Thus to the lowest mark (a) the tube contains 20 grains. To the next line above (marked on the tube $\frac{1}{4}$) 40 grains more, to the line marked $\frac{1}{2}$, 40 grains more, and to the line marked 0, being the commencement of the percentage scale, 80 grains more, or 180 grains in all. The measures of the scale, each marked to indicate one-tenth of one percent, have the capacity of 30 grains each, and are subdivided into 10 parts.

All the above marks are drawn as tangents to the lowest point of curvature of the liquid in the tube (see *a* in the figure) and should always be so read off.

Process of Analysis.

1st. Drop into the tube about half a grain of common salt,* and fill up to the lowest mark with solution of caustic potassa, (U. S. Pharm.) allowing the solution some time to settle down to its proper level.

2d. Carefully fill up to the line 0 with the liquid to be tested, avoiding the slightest excess.

3d. Drop into the tube the test solution, shaking after each addition, until the precipitate which appears, ceases to be redissolved, and the liquid shows a slight cloudiness remaining.

4th. The surface of the liquid now indicates the percentage, which is that of the volume of the liquid; and as the specific gravity of the distilled medicated waters do not differ appreciably from pure water, it will also represent the percentage by weight.

* Chloride of sodium, being the most delicate test for silver is added, in order to detect the minutest excess above that necessary to form the double cyanide of silver and potassium.

5th. Where great accuracy is required, as in analytic investigations, or where the liquid tested has a density differing considerably from that of water, it will be necessary to divide the percentage first obtained by the specific gravity of the liquid under examination; the quotient will give the percentage strength by weight.

6th. In determining the amount of prussic acid in oil of bitter almonds, or oil of cherry laurel, dissolve 20 minims of the oil in enough liquor of potassa to make up when filtered 5 fl. ʒ. Test this clear solution as before directed, and multiply the observed result by 15, and divide by the specific gravity of the oil.

7th. In cases of liquids having a greater percentage of prussic acid than the tube will indicate, as the medicinal prussic acid, &c. instead of filling up the liquid to the line 0 of the tube, fill only to that marked ¼ or ½, and then up to the line 0 with water. After the operation is finished, multiply the result by 4 or 2 according as the line ¼ or ½ was taken.

In repeating any of the processes already mentioned a second time for verification, nearly the whole amount of the test solution as indicated by the first trial, can be poured in at once, and then drop by drop, till the proper quantity as shown by the turbidity is added.

In conclusion I may state, that in trials made with various lots of cherry laurel water, I have met with some that contained scarcely a trace of prussic acid, and therefore as a remedial agent was entirely worthless; while in others, the proportion varied from the minutest quantity up to the full average strength, which is about one-tenth of one percent. In view of this great uncertainty, allow me again* to refer to the following substitute for the distilled cherry laurel water, which will be found upon analysis to contain the above proportion of prussic acid.

℞. Medicinal Prussic Acid,		fl. ʒi.
Oil of Bitter Almonds, dissolved in		♏ij.
Alcohol . . .		ʒij.
Distilled Water, q. s.	ft.	fl. ℥iij.

* The original of this formula I proposed to the Philad. College of Pharmacy several years ago.

ON THE PREPARATION OF RESIN OF PODOPHYLLUM.

By Edward Parrish.

Under the head of *Eclectic Pharmacy*, I contributed an essay to this Journal in 1851, (vol. xxiii. page 329,) detailing a few experiments on the preparation of the Podophyllin of commerce and other impure resins which were then but little known, being prepared by a very few manufacturers, and prescribed almost exclusively by the so-called Eclectic practitioners. Since that time several of these preparations have gained a celebrity in the profession both in this country and Europe, which vindicates their claim to a place in the Pharmacopœia, and we may accordingly look for representatives of this new class of pharmaceutical products in the forthcoming edition of our National Standard. Having been lately engaged upon this resin, for the double purpose of trying a formula and furnishing a characteristic sample of the product, I have noted some of my observations and results which are now presented for what they are worth, to those who may have occasion to use them.

The process for resin of podophyllum consists in exhausting May apple root with strong alcohol, concentrating the tincture, and throwing it into water to precipitate the resin; collecting, washing and drying this. Upon each of these points a few comments are offered.

1*st. Exhausting the root.*—In my former experiments I used the steam displacement apparatus invented by the late C. Augustus Smith, and found alcohol at the boiling point, used in this way, to produce a very concentrated tincture, though the use of the steam displacer involves a good deal of unnecessary trouble in small operations. For treating one or two pounds of the powdered root, which should be fine, a large funnel is convenient; the powder being moistened with a very little, say six fluid ounces of alcohol to the pound, and poured upon a plug of tow or cotton in the apex of the funnel, well shaken and packed after each addition. On a further addition of alcohol the tincture passes drop by drop, very strong, so that a pound may be thoroughly exhausted with from one and a half to two pints. The proper point to desist from the addition of the menstruum is conveniently

ascertained by dropping the percolate into water, when, if it contains an appreciable portion of resin, each drop will occasion a slight cloudiness.

2*d*. *Concentrating the tincture.*—In large operations it will be desirable to recover the alcohol, which may be done with very little trouble with a pharmaceutical still. In evaporating a pint or two of the tincture, an evaporating dish on a sand bath, or submitted to the regulated flame of a gas furnace, will serve a good purpose. The extent of the evaporation is a point of importance, to determine which I have made a number of experiments. If the tincture is not concentrated enough, a considerable proportion of the resin will remain in solution when added to water; if too much, it will not mix with water sufficiently to produce a favorable separation of the resin; in the case of a recipe furnished with a view to its insertion in the Pharmacopœia, I obtained three-fourths as much resin on the partial evaporation of the liquid after the separation of the first precipitate, as was precipitated on the original admixture with water. The best point at which to arrest the evaporation appears to be at from 2½ to 3½ fluid ounces of the evaporated tincture to each pound of the root treated.

3*d*. *Precipitating by water.*—The proportion of water to which the evaporated tincture should be added is not unimportant. I think four parts of water to one, is perhaps most desirable. If the specimen of the root treated was highly resinous, and the extraction was very complete, the alcoholic fluid extract may be rather thick and even of a syrupy consistence at the degree of concentration above indicated; in this case it is better to add it to the water while hot and comparatively fluid.

4*th*. *Collecting the precipitate.*—In some instances, in which this process has been varied to test the eligibility of certain modifications, the resin has been so imperfectly precipitated as in part to pass through a filter, remaining suspended in the filtrate; in others, though arrested by the filtrate, it could be only partially separated after drying; in no case could it be successfully collected by subsidence, so that several experiments were made to find the best method of collecting it. The most successful of these consisted in heating the whole aqueous liquid

as contained in the precipitating vessel in a water bath till, just below the boiling point, nearly all the resin was fused and collected on the bottom and sides of the jar, then by a spoon or spatula the main portion could be collected together, and by rotating the mass, all adjacent particles could be made to adhere to it. The "Eclectics" are in the habit of adding muriatic acid to the water to aid the separation of the resin. I have found this highly advantageous both with reference to collecting the precipitate as only partially separated by water alone, and to procuring the remaining portion after the more completely separated precipitate has been removed. There is an objection on the part of some to such an addition under the supposition that the change must be a chemical one, but I observe no difference between specimens whether collected with or without this addition, and am inclined to attribute the more complete coagulation of the particles of resin under the influence of the acid, which may be used in very small proportion, to a mechanical rather than a chemical alteration.

5th. The drying of the precipitated resin in powder is not a very easy matter. It is rather unsuitable to wrap in paper, especially where artificial heat is to be used, which is apt to fuse it and occasion its absorption by the paper. In one case in which it had been collected on a filter, I was obliged to redissolve it in alcohol, and then pour it out on plates of glass in the manner directed for citrate of iron. It was readily scraped off from the glass but was not in handsome scales. If collected in mass by fusion under water, as above described, it may be kneaded and pulled so as to wash it thoroughly and lighten its color, and may thus be dried without the least difficulty by wiping with paper and exposing to the air at ordinary temperatures. If preferred in powder it is readily reduced by trituration. I prefer it in lumps or pieces, in which condition it is more characteristic, and resembles resin of jalap of the shops. It is more characteristic, and less liable to sophistication or adulteration, when in the condition of broken mass, than in that of powder in which it is usually sold.

The yield, by the process described, varies from three to five percent. of the root; there is, perhaps, always some loss in the course of the process, which is proportionably less in operating on large quantities.

The name recommended, and, it is believed, adopted in the new Pharmacopœia for this remedy, is that indicated in the title of this essay, *Resina Podophylli;* it is to be hoped we shall adhere to this in preference to the misnomer Podophyllin, which, despite its belonging exclusively to the pure crystalline principle of the root, has obtained general acceptance in commercial and even in professional circles, as applied to the amorphous resinous product. Looking to a clearer and more discriminating nomenclature, let us also cease to apply to it and its congeners the term resinoid. If they are not resins, to what shall we apply that term?

PHARMACEUTICAL NOTICES.

By William Procter, Jr.

Syrup and Fluid Extract of Seneka.—Many have observed that syrup of seneka, which whilst hot is perfectly transparent, will frequently, on cooling, be cloudy without precipitating any separated substance. The consistence is often much thicker and less mobile from this cause, which is due to the presence of pectin or pectic acid. The transparency of such cloudy syrup of seneka may be restored by the addition of a small quantity of bicarbonate of potassa, with heat; about four grains to the fluid ounce will usually be sufficient. A drachm of bicarbonate is put in a mortar with a few drops of water, say a fluidrachm, and triturated till the crystals are entirely broken down; then gradually add a pint of the syrup of seneka and mix them. Without heat the reaction is too slow; the syrup is therefore poured into a capsule and heated until effervescence ceases. This may conveniently be effected without loss from evaporation, by heating the syrup, contained in a bottle which it half fills in water-bath, with occasional agitation of the syrup until effervescence ceases. It is then allowed to cool. If a large quantity is acted upon in an open vessel, care should be taken to avoid loss by evaporation, which will tend to cause crystallization of the syrup if not corrected by adding the lost moisture.

Fluid Extract of Seneka.—That which in the syrup produces only thickening and loss of transparence, occasions sometimes complete gelatinization in the more concentrated fluid extract,

especially if it be preserved by sugar. It will be necessary to employ a larger proportion of the alkaline carbonate, varying from two drachms to half an ounce for each pint of the fluid extract, proceeding in a similar manner to that for correcting the syrup as above. My friend, Charles Bullock, has tried this remedy for the gelatinized fluid extract with entire success. There is nothing in this addition therapeutically incompatible, yet it is possible that in extemporaneous mixtures chemical incompatibility may occur, but this the apothecary may guard against.

Furley's albuminous coating for Pills.—At the *Pharmaceutical Meeting* (held in London, Nov. 6th, 1861,) Mr. Furley of Edinburgh exhibited a process for rendering pills tasteless, by a coating of albumen, etc., which he had patented. The process is carried out in the following manner:—Two saucers are employed; the inner surface of one is coated with albumen prepared by well agitating the white of an egg; the other contains a fine powder, composed of equal parts of sugar and tragacanth. The pills to be coated are placed in the first saucer, and are made to revolve in it by a series of circular motions communicated by the hand whilst the saucer is held horizontally. This speedily coats them with a thin film of albumen, when they are quickly transferred to the other saucer, in which they are again caused to revolve and become coated with the powder of sugar and tragacanth. The peculiar tenacious consistence of the albumen tends to prevent the pills from getting a very thick coating, but it is sufficient, if continuous, to fix on their surface sufficient of the powder to form a thin but firm and tough coating when dry. The quantity of albumen to place in the saucer is soon learned by trial, and should not be in excess, lest the pills get too heavy a coating and thus dry too slowly. The ready solubility of the albuminous coating in the gastric juice is a great advantage in this agent. Mr. Furley requires of each pharmaceutist in Great Britain a fee of five dollars for a perpetual right to use his patent process.

Colocynthin.—Under this name there are several substances or preparations now to be found in some of the shops of Philadelphia. Some years ago, whilst on a visit to the Shakers of

New Lebanon, James Long, then the superintendent of their laboratory, showed me a resinous matter which he obtained from colocynth, and which he called colocynthin. I understood him to say that it was prepared from the tincture with hot concentrated alcohol, by evaporation to a syrup, and precipitated by water, as in the process for podophyllin.

Another preparation is a yellowish powder sold by Keith and Company of New York, under the same name.

A third form of this preparation was described by the pharmaceutist who had it as resinous alcoholic extract of colocynth pulp, without any pretence of its being the pure principle.

A fourth form of "colocynthin" is that prepared by Charles Shivers of Philadelphia, which has the appearance of a yellowish brown orange-colored resin in small glistening fragments, or in mass of a darker color. When in powder this preparation is straw-colored. It is exceedingly bitter, and entirely soluble in alcohol. Although a resinous body, the greatest part of this "colocynthin" is soluble in cold water, with repeated malaxation with water, leaving a putty-like resin undissolved, which is insoluble in water. The aqueous solution thus obtained is not precipitated by subacetate of lead, but at once by tannin, and hence this contains the colocynthin proper of Walz.

It is made by a process similar to Mr. Mouchon's (see Amer. Jour. Pharm., vol. iv., 3rd series, page 167,) by passing alcohol through a mixture of powdered colocynth and animal charcoal, and evaporating the liquid to dryness. Mr. Shivers informs me that he obtains about three ounces from a pound of the powdered pulp, which is equivalent to five or six drachms from a pound of crude colocynth. Mr. Mouchon obtained only about four drachms, and describes it as an amorphous garnet-colored resinoid body—intensely bitter.

The most recent investigation of the constitution of colocynth pulp is by Walz, (see vol. vii. 1859, page 331 of this Journal,) who describes colocynthin as a golden-yellow amorphous substance, precipitable by tannic acid from a solution of that part of the alcoholic extract dissolved by cold water, after being freed from interfering matter by subacetate of lead; it is highly active—is a glucoside, decomposable by dilute sulphuric acid, and is insoluble in ether.

It is highly important, that in so active a substance as the active principle of colocynth, the nature of the substance employed should be well understood and not liable to vary. The pure principle of Walz requires too complicated a process, and, with the exception of Mouchon's article, made by Mr. Shivers, we are not well informed of the nature and mode of preparation.

It is, therefore, believed that apothecaries will do right to adopt Mouchon's colocynthin as an active, uniform, and easily obtainable representation of colocynth. Mr. Shivers informs me that in doses of two grains it has acted powerfully, and we believe in half-grain doses, associated with calomel and other agents, it is an effective aperient.

GLEANINGS FROM FOREIGN JOURNALS.

Purification of Amylic Alcohol.—By M. Kirsch. (Neues Rep. fur Phar.) The oil of potato spirit (fusel oil) contains ordinarily 70 to 80 per cent. of amylic alcohol, and from 20 to 30 per cent. of alcohol. It is commonly purified by washing it first with water and afterwards distilling it, collecting the product only after the boiling point of amylic alcohol 269° F. is attained.

This process involves considerable loss, which the author avoids in the following manner: the crude oil is agitated with water saturated with salt; three or four operations appear sufficient for eliminating the greater part of the alcohol. It is then mixed with three or four times its volume of water, and distilled with a naked fire or steam, as in rectifying a volatile oil; the alcohol is all thus abstracted by the water from the amylic alcohol. The product consists of two liquids, the upper oily one being the amylic alcohol, which is separated mechanically by a funnel in the usual manner.—(Jour. de Pharm., Dec. 1861.)

Manufacture of Quinine.—M. Clark, suggests the preparation of quinia, by submitting cinchona to ebullition with water containing muriatic or sulphuric acid, then treating the decoction with an alkaline carbonate as long as it forms a precipitate, adding a small quantity of stearic acid, and boiling. The fat acid fuses and floats on the surface; little by little the quinia and cinchonia unite with it and form an insoluble soap whilst the precipitate blackens. When cool the stearate solidifies and is re-

moved, and boiled in pure water as long as the water is clouded, after which the stearate is treated with boiling acidulated water, which removes the alkaloids.

The hot solution having been carefully neutralized by an alkali, a brown matter is separated by filtration; when by cooling the whole becomes a magma of crystals of sulphate of quinia and cinchonia. These are separated by the ordinary process.

M. Clark asserts that the fatty soap contains all the quinia and cinchonia of the bark treated. He recommends this process also for opium.—(Jour. de Pharm., Dec. 1861.)

On the Rotatory power of the Volatile and Fixed Oils. By H. Buignet.—The author in an elaborate article on the application of certain physical means to pharmaceutical studies, (Jour. de Phar., Oct. 1861,) has subjected various bodies to the circular polarizing apparatus to ascertain their relationship to the polarized ray. After having prepared and carefully purified the following oils, they were examined:—

Essential oil	of	Orange	+ 105·20	Essential oil	of	Cloves	0·00
"	"	Cedrat	+ 88·88	"	"	Cinnamon (Chinese)	0·00
"	"	Caraway	+ 87·33				
"	"	Citron	+ 87·05	"	"	Sage	— 8.93
"	"	Chamomile	+ 48·80	"	"	Thyme	— 11·23
"	"	Nutmegs	+ 34·28	"	"	Peppermint (French)	— 14·30
"	"	Penny Royal (European)	+ 25·47	"	"	Juniper	— 14·79
"	"	Petit Grain	+ 20·47	"	"	Copaiba	— 17·33
"	"	Bergamot	+ 18·45	"	"	Lavender Flowers	— 21.20
"	"	Rosemary	+ 14·67				
"	"	Neroli	+ 10·25	"	"	Yellow Sandal Wood	— 24·30
"	"	Fennel	+ 8·13				
"	"	Lavender (Spike)	+ 3·30	"	"	Peppermint (English)	— 34·29
"	"	Sassafas	+ 2·45	"	"	Turpentine	— 43·50
"	"	Bitter Almonds	0·00				

In the table above, the numbers preceded by the plus mark + have a right-handed, or dextrogyrate, rotation; those with the minus mark, —, have a left-handed or lævogyrate rotation, whilst those without either are indifferent to the ray.

M. Buignet remarks, after examining these numbers; that nearly all of the oils possess a rotatory power; that the oils of the Aurantiaceæ are all dextrogyrate, and mostly to a very high degree; that the oils of the Labiateæ have nearly all a left-handed rotation; that those of the umbelliferæ as tried, are dex-

trogyrate, and that the coniferous and allied oils rotate left-handed, thus showing that to a certain extent a relation exists between the rotatory power of oils in the same botanical group. Before, however, this property of oils can be turned to much account in judging of their identity or purity, it will necessary to collect a large number of accurate observations, yet M. Buignet has tried it in the case of neroli adulterated with *petit grain*, and chamomile mixed with turpentine, and got accurate results.

On submitting the fixed oils to the polarizing apparatus he found them all indifferent but three.

The oil of the liver of the ray, . .	— 0·20
" " " squale, . .	— 6·82
Castor oil, ...	+ 3·63

The two first oils are so weakly negative that this property is of no use in their identification, but in regard to castor oil, it becomes a means of recognition. The author tried this oil prepared four ways, with and without heat, and found it all to possess this rotatory power to about an equal degree.

BERBERIN IN HYDRASTIS CANADENSIS.

By F. Mahla, Ph. D., Chicago.

Hydrastis canadensis L., commonly termed Orange root, or Yellow Puccoon, grows in rich woods from New York to Wisconsin and southward. It is a low perennial herb, which belongs to the natural family of the Ranunculaceæ. The root of this plant contains a large quantity of a yellow coloring matter, and its juice has indeed been used by the Indians to color their clothing yellow. It has been asserted also, that the Cherokees used to employ it for the cure of cancers and other diseases. In regular medical practice the root itself was but little used, until the so-called Eclectic and Botanic physicians began to employ it largely in their prescriptions. Of late even our regular physicians have begun to use an article, which was introduced by several parties under the false name of *hydrastin*. This so-called hydrastin is, as some experiments lead me to believe, not an isolated organic principle, but merely a desiccated alcoholic extract of the orange-root, and must accordingly be so denominated.

Hydrastis, however, contains an alkaloid and there are several methods mentioned by which it may be most conveniently extracted. The Eclectic Dispensatory gives one of those methods, according to which the powdered root should be extracted with alcohol. The tincture thus obtained is then evaporated, the residue mixed with water, the whole filtered and a quantity of hydrochloric acid added to the watery liquid, when a beautiful crystalline precipitate makes its appearance, which was *assumed to be the pure hydrastin.*

The circumstance, that this substance is precipitated from its solutions by a mineral acid, at the first glance makes its basic nature a little improbable. This circumstance combined with the fact, that an organic elementary analysis of this substance does not exist, seemed to make it desirable to have its properties a little better investigated.

In preparing the body in question, I followed in general the above given directions. I modified the process merely by effecting the extraction in a hot-water percolator so that the alcohol was always in boiling condition. I found that by this modification the process was finished in much shorter time, and that less quantities of alcohol were necessary. The crystalline body, formed by the addition of hydrochloric acid, was collected on a calico filter, pressed and redissolved in boiling alcohol. The hot filtered solution readily deposits on cooling such an amount of crystals, that the whole seems to form one solid mass. These crystals were again pressed and once more crystallized from alcohol, after which they were considered pure.

This substance forms, when dry, a light yellow powder, which presents under the microscope the appearance of prismatic crystals. It has a bright yellow color and a very intense bitter taste. It is inodorous and little soluble in cold water, to which it imparts, however, a deep yellow color. Cold alcohol dissolves also very little, but it is readily soluble and in large proportions both in boiling water and in alcohol. These hot solutions exhibit a brown-yellow tint, while the cold diluted solutions are purely yellow. Neither litmus nor curcuma paper is affected by them.

Concentrated sulphuric acid dissolves it with olive green color and disengages hydrochloric acid.

Concentrated nitric acid produces a deep red solution under disengagement of nitrous acid vapors.

It does not emit, any trace of ammonia, when boiled with a diluted solution of caustic potassa, but clots together and is transformed into a brown resinous substance, which adheres strongly to the sides of the vessel. This resinous body is insoluble in water but soluble in alcohol, to which it imparts a bitter taste.

Heated with soda-lime it emits ammonia.

Dry chlorine gas transforms it into a red body, which is readily soluble in water.

Polysulphide of ammonium, when mixed with a hot solution of this so-called hydrastin, produces immediately a red brown precipitate.

Sulphate of copper is precipitated with a yellowish green; nitrate of silver, chloride of zinc, corrosive sublimate, chlorate of potassa, and chloride of platinum with a yellow color. A solution of bichromate of potassa when mixed with a solution of this body throws down an orange-yellow, cyanide of potassium an ochre-yellow, and ferrocyanide of potassium a greenish-yellow precipitate.

When moderately heated it exhibits a deeper yellow tint; the original bright yellow color is, however, restored on cooling; if heated to a higher temperature it melts like a resin and leaves finally a light coaly residue.

All these reactions coincide so completely with the reactions of muriate of berberin, that I should not have hesitated a moment on this evidence alone to declare its identity with that alkaloid.

(The fact that berberin is precipitated from its solution by hydrochloric acid explains the peculiar method of preparation of hydrastin.)

To quiet, however, all doubts, I undertook an elementary analysis of it, which led to the following results:

1. The nitrogen was determined by Will and Varrentrapp's method. Before commencing the experiment, I dried the substance for 10 hours at a temperature of 100° C. The quantity of material employed amounted 0·416 grammes. It yielded 0·236 ammonia-chloride of platinum. This corresponds to 3·563 per cent. of nitrogen. Muriate of berberin at 100° C. requires 3·57 per cent.

2. The combustion for the determination of carbon and hydrogen was made with bichromate of lead.

0·440 substance dried at 100° C. yielded:—

Carbonic acid = 1·0450 which corresponds to carbon = 64·77 per ct.
Water = 0·2035 " " hydrogen = 5·138 per ct.

Muriate of berberin dried at 100° C. requires in 100 parts 64·20 carbon and 4·841 hydrogen.

3. The quantity of chlorine was found by precipitating the boiling solution of the substance with nitrate of silver. This mixture was filtered when still quite hot, and washed on the filter with boiling water.

The material also in this instance was dried at a temperature of 100° C.

0·497 substance yielded 0·1725 chloride of silver; this corresponds to 8·579 per cent. of chlorine.

Muriate of berberin requires 9·03 per cent. chlorine.

Berberin has been discovered thus far in different species of the Berberideæ and in one or two species of the Menispermeæ. This occurrence was one of the principal arguments, with which the union of these two families in one under the name of Cocculineæ was justified.

It is, as far as I am aware, the first instance that this interesting body has been found in a plant, which belongs to the Ranunculaceæ. This circumstance is, therefore, a proof, that even true alkaloids may occur in *several* plants which belong to *different* families.—*Amer. Jour. Sci. and Arts., Jan.* 1862.

[Note.—It is to be regretted that Dr. Mahla did not consult the paper of Mr. Alfred B. Durand, (see vol. 23d, page 113, of this Journal,) alluded to in the U. S. Dispensatory, who first isolated a distinct crystalline alkaloid from the Hydrastis. I have a sample of Mr. Durand's hydrastin, and it is not berberin, but crystallizes in light yellowish crystals of considerable size. The yellow coloring matter noticed by Mr. D. is probably berberin. As Mr. D. did not resort to precipitation by muriatic acid, he did not notice the peculiarity of its precipitation in yellow silky crystals. Mr. Merrill, of Cincinnati, who has recently sent a specimen of the same alkaloid, as that described by Durand, to this city, says it is quite distinct from the yellow crystalline *hydrastin*, as used by the Eclectics. We invite Dr. Mahla's attention to this subject.—*Editor Amer. Journ. Pharm.*]

ON THE ORIGIN AND PROGRESS OF THE PHOSPHORUS AND MATCH MANUFACTURES.

By G. Gore.

(Continued from page 59.)

This wet and finely-divided substance having been dried, sifted, and packed in air-tight tins is ready for sale.

It is well known in modern chemistry that a substance may exist in two or more physical states, possessing very different physical and chemical properties, and that there may be as great a difference in the properties of the same substance in its different states of aggregation as there is between two chemically different substances. For instance, there is as great an amount of physical difference between carbon as it exists in the diamond and as it exists in pure lamp-black, as between copper and silver or silver and gold. The two kinds of phosphorus we have described are, then, precisely the same chemical substance, but in different states of aggregation. The following is a comparison of their properties. We will, for convenience, term them white and red phosphorus :—

White.	*Red.*
Poisonous.	Innocuous.
Evolves a strong odor.	Nearly odorless.
Phosphorescent—luminous in the dark.	Not phosphorescent—perfectly illuminous.
Melts at 108° F.	Melts at above 500° F.
Very transparent.	Opaque.
Almost colorless.	Varies in color from nearly black (with metallic lustre) to iron-gray, brick red, crimson, and scarlet.
Freely soluble in various liquids.	Nearly insoluble in all liquids.
Distinctly crystalline.	Destitute of all crystalline structure (amorphous).
Soft, may be indented by the nail.	Hard as a common red brick.
Flexible as copper or lead.	Brittle as glass.

The great and most conspicuous fact is that red phosphorus

may be kept in the dry state, exposed to the air, without inflaming; whilst the ordinary variety, under the same circumstances quickly ignites. The minutest quantity of ordinary phosphorus in the red or amorphous variety can be detected by digesting the latter, in the state of powder, in bisulphide of carbon, and then letting fall a single drop of the clear liquid upon a saucer floating upon boiling water in a dark place; luminosity will immediately appear if white phosphorus is present.

There are several uses to which phosphorus has been applied, but, as far as quantity is concerned, almost the only important application is in the manufacture of lucifer matches. It is remarkable that, although the property of phosphorus of igniting by friction was known soon after its discovery, it was not until about the year 1833, that it was successfully applied to the manufacture of matches. It was then sold wholesale at four guineas a pound; in 1837, at two guineas; and at the present time, at less than half a-crown. Manufactories of it exist in Great Britain, France (Lyons), Bavaria, Baden, Austria, and Sardinia.

Since the commencement of the manufacture of phosphorus upon a large scale in England, in 1835, the value of phosphorus imported into this country has regularly and rapidly decreased. According to the reports of the Great Exhibition of 1851, the value of phosphorus imported from all parts into Great Britain in 1844 was 2567*l.*, and in 1850 only 3*l.* And since that period it has become an article of constant export to the Continent and other parts, the proportion consumed in the United Kingdom being comparatively small. In his "Catechism of Agricultural Chemistry," Professor Johnson states that 200,000 lbs. of phosphorus are consumed in London alone per annum. Persons conversant with the actual consumption know that at that time, and probably at the present hour, it would not exceed 20,000 lbs.

It is also stated in a recent publication on Chemistry, by Professor Muspratt, (article "Phosphorus," p. 680,) that phosphorus "is prepared as an article of manufacture in large quantity in London and Paris. Kane has calculated that in the latter city alone about 200,000 lbs. are yearly produced." There may have been once a very small production in London and Paris, but it has long since entirely ceased. The enormous consumption of fuel necessitates that, for economic production, the manufac-

tory be placed where coal is cheaply obtained; and the quantity of phosphorus produced in all France, at the date of Dr. Kane's book, is not likely to have been at all more than 20,000 lbs. It is plain that, by mistake, a cypher too many has been added.

Reserving a few remarks upon the importance of the labors of Brandt, Boyle and others who investigated phosphorus, until the close of this article, I will now give a brief account of the gradual development and present condition of the lucifer match manufacture.

The earliest recorded means of obtaining a light appears to have been by means of rubbing together two dry sticks. A hole having been made, by means of a sharp stone, in a dry piece of wood, and, by the same means, a piece of stick of different wood —laurel with ivy for instance—having been cut to a point at one end, the sharp point was inserted in the hollow, and rapid rotation imparted to it by means of the hands, similar to the motion of a chocolate stirrer, until, in a few minutes, the friction of the point generated sparks, from which fire was obtained. Sulphured matches also are of very ancient origin.

The next method—that of the common flint and steel—was in use for centuries, and can even now be remembered by every adult person. It consisted in striking the edge of a small piece of flint against the edge of a rod of iron or hardened steel, in such a direction that the sparks which occurred fell upon pieces of tinder (charred linen), contained in a shallow tin vessel, and ignited them. By gently blowing the ignited tinder, the combustion spread and became sufficient to inflame a sulphured match. If the tinder was at all damp, it failed to ignite.

The discovery of phosphorus in 1669, with its luminous and igniting properties, at once indicated the possibility of useing it to obtain a light; but no successful experiments of the kind at that period have been recorded. It was not until 1833 that it was successfully applied. In the mean time, a number of inventions for obtaining a light, some involving the use of phosphorus, and others not, were adopted to a limited extent. Phosphoric tapers, consisting of ordinary wax tapers, with their wicks coated with phosphorus, and enclosed in air-tight glass tubes, were for some time in use. To obtain a light with them

the end of the glass tube was broken off, and the phosphorus now exposed to the air, oxidised quickly and inflamed.

The next plan consisted of a well-corked bottle, coated internally with phosphorus: a sulphur match was introduced into it, and a little of the phosphorus adhering to the top of the match, caused the sulphur to inflame on coming into contact with the air. If it failed to ignite, the action was assisted by rubbing the match upon the cork of the bottle.

Homberg's pyrophorus, or fire-bearer, consisted of a dried and roasted mixture of three parts of alum and two parts of flour or sugar contained in a well closed bottle. A little of this powder exposed to the air upon cotton wool ignited the cotton. This mixture contained no phosphorus. There were several other mixtures of a similar kind by Gay Lussac, Dr. Hare, and others, but they were only used by the curious and scientific.

The "inflammable air-lamp" of Volta consisted of a stout glass vessel containing zinc and diluted oil of vitriol. Hydrogen gas was generated by these substances, and on turning a cock the issuing jet of gas was ignited by an ingenious contrivance, consisting of an electrophorus, which passed an electric spark through it at the moment.

The "light syringe" consisted of a vertical brass cylinder and piston, with a small piece of tinder placed inside at the bottom and closed end. On compressing the piston very rapidly and with great force, heat was evolved by the condensation of the air and ignited the tinder, which was then removed by various contrivances.

In 1804, a little bottle, containing a mixture of phosphorus, oil, and wax came into use. A sulphur match was dipped into the composition and then ignited by rubbing it upon the cork of the bottle. This was succeeded by a similar bottle of composition, with matches tipped with a mixture of sulphur and chlorate of potash.

In 1807, the "chemical matches," composed of sulphur matches tipped with a mixture of chlorate of potash, sugar, gum, vermillion, and sometimes camphor, were invented. They were ignited by dipping them into a bottle containing abestos fibre moistened with sulphuric acid.

About the year 1820, Döberiener discovered that finely-divided

platinum has the property of causing a mixture of oxygen and hydrogen gases to unite and inflame, and invented his well-known hydrogen lamp. This consisted of an apparatus somewhat similar to Volta's for generating hydrogen by means of zinc and and diluted sulphuric acid in a strong glass vessel. On turning a small tap a jet of the gas issued forth and impinged upon a small ball of the platinum powder which immediatly became red hot and ignited it; from this a taper was lighted. By a peculiar mechanical contrivance in this apparatus, when the gas issued from the orifice, the acid and water came in contact with the zinc and generated a fresh supply of gas; and as soon as the tap was closed and a sufficient stock of the gas was produced, the liquid was expelled by the gas from contact with the zinc, and the generation of gas ceased.

In 1826 "lucifers," or light-bearing matches, were invented. They consisted of ordinary sulphur matches, tipped with a composition of chlorate of potash and sulphuret of antimony, and were ignited by drawing them briskly between folded glass paper.

The defect of these was that they required a considerable effort to ignite them, and the composition was apt to be torn off by the violence of the friction.

These were succeeded in 1828 by the "Prometheans," consisting of a small roll of gummed paper, containing at one end a dried paste of sugar, chlorate of potash, gum, and water, together with a small bulb of glass containing oil of vitriol. They were ignited by means of a small pair of pliers supplied with the box of matches.

In 1830, bottles, containing a mixture of one part of manganese and two parts of phosphorus, were patented for producing a light. Into these bottles common sulphur matches were dipped, and ignited by oxidation of the phosphorus on exposure to the air.

All these inventions failed to supersede the old tinder-box with its flint and steel, chiefly on account of their greater expense, but also on account of their dangerous and uncertain action.

About the year 1833 phosphorus was at last successfully introduced into match composition, and from that period the tinder-box rapidly declined in use, and the new matches became a successful and extensive branch of manufacture.

The phosphorus match did not, however, at once acquire the degree of perfection it now possesses. A variety of substances were tried in the preparation of the match-splints and in the composition of the inflammable paste: vegetable wax, bees' wax, sulphur, stearine, oil, and fat to make the wood ignite; glue, gum, and sugar to make the mixture adhere; chlorate of potash, saltpetre, sulphur, sulphuret of antimony, antimonial saffron, red lead, and peroxide of manganese to increase the combustibility; powders of charcoal, cork, pitch, resin, magnesia, lime, or chalk, to make the composition more porous; powdered glass, sand, or emery, to increase the friction; and vermillion, red lead, red ochre, prussian blue, smalts, ultramarine or chromate of lead, as a coloring matter, and to disguise the other ingredients.

The following is the general process of manufacture of matches as now in use:—The wooden splints for the matches are prepared from the very best quality of pine planks, perfectly desiccated at a temperature of 400° Fah. Each plank is cut into about thirty blocks about eleven inches long, four and a half inches wide, and three inches thick. A block is fixed with its small end downwards between two uprights, the grain of the wood being horizontal. A frame, having fixed upon its upper surface about thirty lancets one-eighth of an inch asunder, with their points projecting upwards one-eighth of an inch, reciprocates to and fro beneath the end of the block of wood by means of a crank, and in doing so scores the whole of the lower surface of the block with a number of parallel cuts, about one-eighth of an inch apart and one-eighth of an inch deep, in the direction of its fibres. Immediately upon this a sharp blade, or scythe, swings round horizontally beneath, and cuts off the scored surface to the thickness of one-eighth of an inch, in the form of square splints four and a-half inches long, which fall through a shoot into a room beneath. The block now sinks one eighth of an inch and the operation is repeated. In this way between two and three millions of splints are readily formed by steam power in a single day. English splints are of two sizes—large and minikins: the larger ones are two and a quarter inches long (or double-length, as first formed, *i.e.* four and a-half inches), and the minikins are rather shorter.

In England the splints are square in form, and produced as above; but in Germany they are cylindrical, and are prepared in this shape by placing the small block of wood with the ends of its fibres downwards upon a strong plate of steel of larger surface perforated over the greater part of its surface with holes of the size of the splint, countersunk at their entrances to form cutting edges, and as close together as possible. Great pressure being now applied to the upper end of the block, it is forced through all the holes, and reappears on the lower side of the steel plate in the form of a heap of cylindrical splints.

Returning to the English splints: they are collected as they are cut, and measured into bundles of six dozen each by a man who seizes a number of them in his hands from the loose and irregular heap, and by dexterous jerking, knocking, and shaking, arranges them parallel to each other, then places them in a short open gutter or cradle, across which he has previously thrown a piece of string, and when the measure is full to the level of its edges he ties up the bundle, throws it aside, and proceeds with another with equal rapidity. The bundles are then perfectly dried by exposure for several hours in a heated oven.

The bundles of splints are next coated at both ends with sulphur. A quantity of brimstone is melted in an iron pot, and one end of a bundle being quite scorched by contact with a red-hot plate is immersed into the melted sulphur to the requisite depth; then repeatedly swung in the air, to throw off the superfluous sulphur, and rolled violently upon its axis and beaten, to prevent the splints adhering together in one mass as the sulphur hardens. The other end is then similarly treated. In some cases the ends of the splints are saturated with wax instead of sulphur in a similar manner.

A child now arranges the splints in a number of successive rows, one above another, in a frame, each splint separate from the others, in the following manner:—He takes a narrow, wooden frame composed of three fixed pieces, a narrow bottom cross-piece about sixteen inches long and two inches wide, with two vertical pegs about eight inches high, one at each end; and has by his side about two dozen loose strips of wood of similar length and width to the bottom piece, and with holes or notches at their ends to receive the upright pegs; each of these strips

has a series of fifty transverse, shallow notches upon its upper surface to receive fifty splints, and is covered on its lower side with felt or other soft material. Having placed one of these strips upon the bottom piece, he takes up a handful of splints and quickly deposits fifty of them, one in each groove, their ends projecting one and a quarter inches on each side; he then places another strip upon the first one, and fills it in like manner, and so on until the pile of twenty-four rows is complete. A thicker strip of wood, similar to the bottom piece, covered upon its lower side with felt, is then placed upon the top, and the whole secured moderately tight by means of thumb-screws, or pegs fitting into holes in the uprights. The splints are then ready for being tipped at their ends with the phosphorous composition. Many children are employed at this kind of labor.

The exact ingredients, and their proportions, in the phosphorous composition, differ in different countries and with different manufacturers, but they all consist essentially of emulsions or mixtures of phosphorus in a solution of glue or gum arabic, with or without other matters for increasing the combustibility, for coloring, &c. In England the composition contains a considerable quantity of chlorate of potash, which imparts a snapping quality, and noisy projecting flames, and but little phosphorus, on account of the moisture of the climate; other substances are also added to give hardness and power of resisting moisture. The following is about the composition of the best quality:—

Water . . .	4	parts by weight.
Glue . . .	2	" "
Phosphorus . .	1½ to 2	" "
Chlorate of potash	4 to 5	" "
Powdered glass .	3 to 4	" "

In Germany the proportion of phosphorus used is much larger, and gum is used instead of glue, together with nitrate or protoxide of lead, and no chlorate of potash. In consequence of the presence of so much phosphorus and the absence of chlorate of potash, the German matches light quietly, with a mild, lambent flame, and are injured quickly in a damp place by the oxidation of the phosphorus and the production of

phosphoric acid, which attracts moisture. One of their mixtures, given by Böttger, is composed as follows:—

Phosphorus	.	4	parts by weight.
Nitrate of potash	.	10	" "
Fine glue	.	6	" "
Red ochre	.	5	" "
Smalt	.	2	" "

In every case the glue is first broken into small pieces and soaked in cold water until quite soft, then added to the requisite quantity of water and heat applied by means of a water-bath until it is quite fluid, and at a temperature of 200° to 212° F. The vessel is then removed from the fire, the phosphorus gradually added, and the mixture agitated briskly and continually with a stirrer, having wooden pegs or bristles projecting at its lower end. The chlorate of potash, coloring, and other matters, all in a state of very fine powder, are then added, one at a time, to prevent risk of accident, and the stirring continued until the mixture is comparatively cool. By this means the minute particles of phosphorus are kept from uniting into large globules, and the heavier matters are prevented from sinking to the bottom.

In the process of tipping the ends of the matches (termed in the manufactory "dipping") a quantity of the composition is spread, by means of a large palette-knife, upon the horizontal surface of a smooth stone or plate of iron, heated by means of steam beneath. The mixture becomes much more fluid by the heat, and is spread to a width and length of about ten inches by twenty, and a uniform depth of about one-eighth of an inch by means of a horizontal gauge. The "dipper" then takes a frame filled with splints, as already described, strikes the ends of the splints upon a bare part of the stone until the whole of those ends exhibit a flat, uniform surface. He then dips those ends, either once, twice, or more times, into the mixture, until they have all received a proper amount, and hands the frame to a boy, who places it upon a rack in a current of air, in order that the composition may cool and harden. Meanwhile the dipper proceeds with other frames in like manner, and replenishes the layer of composition occasionally. After a number of frames have been thus dipped, and the composition

upon the splints in them has partly hardened, they are all taken, one by one, in the original order, and the other ends of the splints tipped in a similar manner. With six dipping-stones, half-a-dozen workmen have dipped as many as twenty millions of matches in a single day. This method of dipping is termed "frame-dip;" but there is another process called "bundle-dip," which consists in taking a bundle of the sulphured splints, and twisting it in such a manner that the ends of the splints spread out like a brush and separate from each other; they are then tipped with composition like ths others. In this process the *ends* only of the splints acquire a coating of the mixture, whereas in frame dipping the composition extends a short distance up the *sides* of the splints and is more firmly attached. Bundle-dipped matches are inferior to frame-dipped ones.

In the manufacture as now being described it will be observed that each splint is 4½ inches long, coated with composition at both ends, and will therefore form two matches by being cut asunder in the middle; but this is not always the mode of proceeding; in some manufactories the splints are cut in two before being dipped, and are tipped at one end only.

As soon as the composition is partly dry, and of such a degree of hardness as to bear the next operation without igniting and without rubbing off, the splints (those coated at both ends) are quickly removed from the frames into parallel heaps, and the frames set at liberty. A man now takes a heap of fifty of the splints, places them between two vertical supports in a horizontal channel or trough of wood, passes a string with a weight over them to prevent their falling about, and cuts them through at their middle by means of a cork-cutter's knife, moving upon a hinge like a chaff-cutter's scythe. He then places them in heaps of 100 matches each, ready for boxing. The little boxes are now filled by women and children, who perform the operation with exceeding rapidity, and before the matches are dry, in order to avoid accidents. Each match passes through the hands of about seventeen persons, chiefly children, in its process of manufacture.

Trays of sawdust are placed near the various workmen and operators to plunge the matches into in case they ignite.

Vessels of water are also freely at hand in case of accident. Also a quantity of sand is strewed in a layer of several inches deep beneath the racks upon which the frames of matches are set to harden, so that in case of a frame of matches falling, the flames may be quickly extinguished. A lotion, composed of olive oil and lime water, is exceedingly useful to apply to the skin in cases of burning by phosphorus.

(To be continued.)

ABSORBING POWER OF THE ROOTS OF PLANTS.

By Dr. Jessen.

Dr. Daubeny has established that different species of plants, growing in the same soil, take up therefrom different foods, and certain minerals in different proportions. This selection, it will be said, is made through "vital force,"—a convenient phrase for hiding anything that you cannot or have not inquired into. If we went down to the elementary composition of the human body, the term might be defined as meaning the formation and combination of cells. In this sense it corresponds with, and has comparatively the same range as the term "crystallizing force," as regards minerals. The force which puts together crystals, and that which puts together cells, and forms them into living bodies, is equally an unknown force; we use for each the term mentioned. Taking "vital force" to mean the formation and combination of cells, the secretive power of plants was thence to be explained. Some ancient philosophers held that plants desired and selected food nearly in the same way as animals. That opinion was long ago given up; but where is the difference between animals and plants? Men and animals move to food that they want; plants grow for it. This was a point too often overlooked. But animals can move away or cease to take food when satisfied; plants advance their roots amongst their food, and they cannot use the same parts of the same root for obtaining that root a second time. They have, so to speak, to throw out new fibres every time they want food. A sound rootlet took up fluid, whether nutritive or not, in a manner different from an injured one; and many physiologists, and nearly all chemists, have experimented on wounded plants, without knowing it, owing to the delicate handling which rootlets require. The absorption goes on

by endosmosis through the bark cells. Dr. Grahame says that by every such process the membrane of these cells is thinned and dissolved; that the endosmosis is different for every different membrane; and that the force of endosmosis is altered not only by the different nature of the substances going into the cell, but also by the nature of the sap in the cell itself.

The author considers these facts, as made out by Mr. Grahame, to be the starting point of a new era in the physiology of nutrition. No one has yet taken up the matter and pointed out the uses of these discoveries, and it was sufficient at present that Dr. Grahame shows that any slight difference in the composition of a membrane, or of the contents of a cell, will be sufficient cause for a decided difference in the nature of the food introduced into it. The point of a rootlet is of very different structure from its upper part. It serves only for the growing out of the rootlet, whose cells are formed in the upper part. Many of the cells run into short hollow hairs, which, like the cells, have a very thin membrane. The fluid taken in by the rootlet, after a time destroys the outer layer of cells, and the second layer comes into play, but the constant production of new cells in the interior causes the rootlet to increase in size. Passing from cell to cell the fluid becomes changed into sap; but the sap differs in every cell, and each cell around one well filled gets out of it a different kind of food. The author contends that it is not possible to get into a plant anything that is a poison to it. The result will be, if poisonous matter is present, that the outer layer of cells will be destroyed, succeeding layers presenting themselves, and also being destroyed so long as the poison exists around. If the poison gets into the outer cells before they are wholly destroyed, it will not be taken up so readily as a nutritious liquid; and in any case, after traversing a few rows of cells, all poison will be retained, whilst other portions of the plant will remain uninjured.—*Proceedings of the Brit. Assoc. a Manchester, Sept.* 1861.

QUICKSILVER.

The magnitude of our Quicksilver export the present year is calculated to attract attention. Not only has there been an entire recovery of that trade from the low ebb it had reached under

the legal embarrassments which, in 1858, were placed on the production of a leading mine, but the prospect is fair that we shall largely exceed in the exportation of this metal the present year any preceding year in our history. Indeed, we have already run ahead of 1857, our largest previous export year, by 2,586 flasks, and the demand is steadily increasing, the increased requirement being large in the direction of Mexico, which country at this time is our second best customer, China being first on the list. The following have been our exports and the value thereof, from January 1st, present year, to date:

To	Flasks.	Value.
China	14,588	$469,498 00
Mexico	7,632	236,732 20
England	2,000	60,030 00
Peru	1,808	58,232 50
Chili	1,559	49,920 00
Australia	1,350	45,850 00
New York	625	23,265 00
Central America	132	4,193 20
Vancouver Island	104	3,328 38
Japan	50	1,500 00
Total	29,848	$952,519 28

It may be regarded as not a little singular that quicksilver producing countries are among our best customers for this metal. China, Mexico, and Central and South America, all produce the article, but through lack of energy or skill in its production, are forced to depend on imports. Its large consumption in China is mainly in the manufacture of vermillion. In Mexico, Central America, &c., we need scarcely state that its sole employment is as an amalgamator of the precious metals.

At present, as far as we can learn, nearly all our mines are in active course of development. The New Almaden, the New Idria, the Enriqueta, and others, are turning out the metal in unwonted abundance, while from the north we hear that the interesting Geyser discoveries are about being worked on a scale commensurate with the high expectations entertained for them. What effect this increased production may exert on prices remains to be seen.—*Alta Californian.*

EFFERVESCING CARBONATE OF IRON.

In the last number of the *Chemist and Druggist* we noticed some very well made effervescing Chalybeates. As some of our

readers are anxious to know the exact mode of forming these elegant aperients, we insert Dr. T. Skinner's formula for this preparation.

℞ Acid. Tart., ℥iij.
Sod. Bicarb., ℥v.
Ferri Sulphas., ʒx.
Pulv. Sacch. Alb., ℥i. ʒvi.
Acid. Citric, ʒij.

First. Mix the sulphate of iron with the sugar, and part of the tartaric acid.

Secondly. Mix the citric acid with the remainder of the tartaric acid, and bicarbonate.

Thirdly. Stir the two mixtures together, and thoroughly unite them by sifting.

Lastly. Put the whole into an open metal vessel in a water bath, and stir until it is well granulated. In these proportions there are ten grains of sulphate of iron in every drachm and a half; this will produce, by double decomposition, four grains of pure protocarbonate of iron.

It is also needless to observe that the materials employed should be finely powdered, very dry, and that the preparation should be kept from the air and moisture by being preserved in well-stopped bottles.

We believe that the more frequent employment of remedies of an elegant and unobjectionable form is of more importance than is frequently imagined—a patient often refusing to take nauseous though perhaps important medicines who would readily take the same remedies in a less objectionable form; hence we are always glad to notice any improvement, having for its object the rendering of medicaments less obnoxious to the palate. Under this class of improvements we may rank the two extremely elegant compounds named at the head of this notice; they are white granular solids, rapidly dissolving in water with brisk and lively effervescence, and furnishing clean, transparent, colorless solutions of a really pleasant and tonic taste.

The more simple contains one grain of citrate of quinine to each dram, and the other possesses, in addition, two grains of citrate of iron.

The preparations are obviously very carefully made, and are

stated to retain their properties unchanged for any length of time if kept from access of moisture. To a convalescent, requiring the continued use of either iron or quinine, we can hardly imagine a greater boon than these will prove themselves to be, as, whilst retaining all the potency of the drugs, they are as pleasant as a glass of soda water.—*Chemist and Druggist, Nov.* 15, 1861.

ON THE TENACITY OF METALLIC COBALT.

The quite recent discovery of the exceeding tenacity of metallic cobalt, *which is double that of iron*, promises to place this metal in the first rank of mechanical utility. Oxygen being cheaply attainable, its ores will, in all probability, be smelted, and the metal produced in large quantities; and should a cobalt steel exist, bearing similar relation in its qualities to those which ordinary steel bears to iron, there seems no limit to the improvement of our tools, engines and every fabric in which lightness and strength have to be combined.—(Note to Sir John F. W. Herschell's treatise on Physical Geography, bearing date April, 1861.)

In order to appreciate the importance of this discovery, it must be borne in mind that iron has been heretofore regarded as the most tenacious of the metals, and that copper, which ranks next to it, has but half its tenacity.—D. B. S.

ON SOME APPLICATIONS OF CARBOLIC ACID, OR HYDRATE OF OXIDE OF PHENYLE.

By Dr. F. Crace Calvert, F. R. S.

Although carbolic acid has long been known to possess powerful antiseptic properties, its use has been delayed in medicine owing to the difficulty experienced in obtaining it in considerable quantities and in a state of purity, as well as to the caution required in introducing new substances in that branch of science. The success, however, which has lately attended its application, will tend greatly to increase its importance as a therapeutic agent. It has been used with marked advantage in the Man-

chester Royal Infirmary by several of its distinguished physicians and surgeons. Thus, Dr. Henry Browne has given it in solution in water in cases of chronic diarrhœa with very satisfactory results. Dr. Roberts has applied it with very great success in the dose of one drop, in cases of vomiting, even after creosote had failed; he has also found it beneficial in cases of vomiting from dyspepsia, which disease is especially marked by pain after food. Mr. J. A. Ransome has used it for ulcers and other offensive discharges. Mr. Thomas Turner, in a note which he has communicated to me, speaks of carbolic acid in the following terms:—

"It may be advantageously used as a solution of one part of acid in seven parts of water, in fœtid ill-conditioned ulcers. It alters the action of the blood-vessels causing a purulent instead of a sanious discharge, and destroys almost immediately the offensive smell of the secretion. The ulcers having a communication with carious bone, or even necrosis (where the bone is dead,) it has in its diluted state a good effect when injected into the sinuses leading to the diseased bones. When there is mere caries or ulceration of the bone it effects the healing process, and in necrosis it promotes the exfoliation of the dead portion. * * In gangrenous and all offensive sores it removes all disagreeable smell and putrescency, and may render the discharge innocuous to the contiguous living and unaffected tissues. In its diluted state, therefore, it is a great boon to patients laboring under that class of disease."

Mr. Heath, house-surgeon of the infirmary, has used it with two parts of water as a lotion in sloughing wounds, and has found that in a short time after its application, it entirely arrests the sloughing process, and produces a healthy appearance.

Dr. Whitehead has used with advantage Dr. Robert Angus Smith's solution of sulphites and carbonates of lime and magnesia.

In July, 1859, M. Velpeau drew the attention of the French Academy of Sciences to the value of the mixture of coal-tar and sulphate of lime of MM. Corne and Demeaux in the healing of ulcers and other offensive wounds, and it may be added, that this mixture was used with great advantage in the French army after the great battles of Magenta and Solferino.

In the following month I forwarded a note to the French

Academy, pointing out that from experiments I had made with the various substances existing in coal-tar, it was highly probable that carbolic acid was the active agent of the coal-tar used by MM. Corne and Demaux, and that much more certainty might be expected if that acid were substituted in their mixture, for the composition of coal-tar varies according to the nature of the coal, and the temperature employed in its preparation. I also suggested that it was probable that the powerful antiseptic properties of carbolic acid prevented the decomposition of the adjacent parts, and thus tended to restore the wounds to a healthy state, and to remove the cause of infection. Before quitting this part of the subject, I beg again to call attention to a fact which I have already published in one of my papers, namely, that the addition of two or three drops of this acid to a pint of freshly made urine, will preserve it from fermentation or any marked chemical change for several weeks.

I have also applied it lately to foot rot, which annually carries off large numbers of sheep, and I have been given to understand that the remedies hitherto adopted in this disease have been only partially successful. I think that if my experiments are further confirmed, it will prove a great boon to the farmers of this country.

This acid has also been applied by me during the last twelve months to the preservation of gelatine solutions and preparations, of size made with starch, flour, and similar substances, and of skins, hides, and other animal substances. In fact, its antiseptic powers are so great, that it is the most powerful preventive of putrefaction with which I am acquainted. It appears also to act strongly as an antiferment, for I have proved on an extensive commercial scale, that it prevents (as stated by me in a paper published in 1855) the conversion of tannin into gallic acid and sugar. It also arrests lactic fermentation. I am now engaged in a series of experiments to discover if that power extends to alcoholic, butyric, and acetic fermentations. I hope also to communicate to you shortly the results of my experiments on the protection of timber from dry rot.—*London Pharm. Jour., Dec.* 1861.

RESEARCHES ON HYPOPHOSPHITE OF LIME,

By M. Gerard Janssen.

1. *Preparation.*

The hypophosphites are seldom met with chemically pure; this is due to those terrible explosions to which the most skilful operator exposes himself in their preparation; prompted by a well-grounded fear, he dares not conduct the process to the end, and the product obtained is more or less altered by foreign substances.

The properties attributed to such preparations cannot be those of the hypophosphites chemically pure. The author of these researches sought a new method of preparation, which would permit of obtaining these salts perfectly pure and without danger.

He first investigated the causes of explosion; these he found to be due to—1st, the action of heat, and the oxygen of the air on the phosphuretted hydrogen ($P H_3$); 2nd, the production of biphosphuretted hydrogen ($P_2 H$); 3rd, the formation of a peculiar and very explosive compound, to which he gives the name of triphosphuretted bi-hydride ($P_3 H_2$). This substance crystallizes in hexagonal prisms. As long as the temperature of the mixture remains constant, there is no fear of explosion, but if after the heat has decreased it be then raised, the triphosphuretted bi-hydride is instantly decomposed into phosphorous and phosphuretted bi-hydride ($P H_2$), which takes fire spontaneously. Alcohol is the only compound which prevents these explosions, because it not only arrests the action of the oxygen of the air on the phosphuretted hydrogen and the production of biphosphuretted hydrogen, but also, what is more important, the formation of phosphuretted bi-hydride.

To prepare the hypophosphite of lime, which may be taken as a type of these salts, a sufficient quantity of hydrate of lime is mixed with three times its weight of distilled water, to which a third of pure alcohol has been added. The mixture is introduced into a long-necked flask heated gently in a sand-bath. When the mixture has attained a temperature of 50° to 60° Cent., small pieces of phosphorous are gradually added, until the action has entirely ceased. The apparatus is allowed to cool, and the solution filtered through asbestos. The filtered liquid is

freed from alcohol by distillation in a retort, the residual solution evaporated to perfect dryness, and the white powder thus obtained preserved in well-stoppered glass bottles.

The hypophosphite may be crystallized in the retort by a slow evaporation.

The action of the alcohol is thus explained: the phosphorus acting on the hydrate of lime by heat gives hypophosphite of lime and phosphuretted hydrogen.

$$4\,P + 3\,Ca\,O + 3\,HO = 3\,(PO, Ca\,O) + PH_3.$$

Two intermediate compounds are also formed: biphosphuretted hydrogen and triphosphuretted bi-hydride.

$$8\,P + 3\,Ca\,O + 3\,HO = 3\,(PO, Ca\,O) + P_2H + P_3H_2.$$

The alcohol decomposes these two compounds, forming phosphide of ethyl.*

This again is decomposed by the base into hypophosphite and alcohol, a part, however, remaining mixed with the alcohol recovered by distillation; this may serve for a subsequent preparation.

The action terminates by a feeble evolution of hydrogen, from the decomposition of the phosphuretted hydrogen; one part becoming combined during the operation with the oxygen of the air, forming water.

$$PH_3 + 2\,P_2H + 2\,P_3H_2 + 9\,C_4H_6O_2 = 9\,C_4H_5P + 2P + 18\,HO.$$

$$4\,P + 3\,Ca\,O + 3\,HO = 3\,(PO, Ca\,O) + P\,H_3$$

$$\begin{cases} P\,H_3 + C_4H_6O_2 = 2\,HO + C_4H_5P + 2\,H. \\ P\,H_3 + C_4H_6O_2 + 2\,O = 4\,HO + C_4H_5P. \end{cases}$$

2. *Properties.*

Hypophosphite of lime is a white powder, inodorous, but of an acrid and burning taste. Deliquescent and very soluble in

* The phosphide of ethyl when separated from the alcohol, is a limpid fluid of a phosphuretted odor and burning taste. It is very volatile, burning at 90° Cent. It is soluble in alcohol; the solution has an opaline appearance. In water it separates in drops like chloroform, which it also resembles in its anæsthetic properties. It burns with an emerald green flame, exhaling an intensely disagreeable odor. A little powdered tin, bismuth, or antimony, placed in the flame, causes the color to pass to pale violet, and finally to pure white. The great danger which attends the preparation and manipulation of this substance, has not yet permitted the author to study all its properties.

water, scarcely soluble in ether and absolute alcohol. Soluble in fixed and volatile oils, it is precipitated when they become rancid. It crystallizes with difficulty; the crystals contain two equivalents of water (PO, CaO, 2 HO.) Its solution, exposed to the air, is transformed into carbonate and biphosphate of lime. Oxygen converts it first into phosphite and then into phosphate. It immediately decolorizes a solution of sesquisulphate of manganese ($Mn_2 O_3$, 3 SO_3).

Sulphur, selenium, and tellurium, also decompose it into phosphite, then into phosphate, with formation of sulphide, selenide, or telluride of calcium.

Boron, silicon, and carbon decompose it by heat, borate, silicate, or carbonate of lime is formed, and phosphorus evolved in vapor.

Hydrogen decomposes it into phosphate and phosphuretted hydrogen.

Hydrochloric, hydriodic, hydrobromic, and hydrofluoric acids decompose it into phosphate, phosphuretted hydrogen, and a haloid salt.

Nitric acid converts it into phosphate, hyponitric acid being evolved.

The alkaline bases decompose it into phosphate and phosphide.

The alkaline carbonates when boiling, and the alkaline sulphates in the cold, transform it into an alkaline hypophosphite, and carbonate or sulphate of lime.

It precipitates metallic gold from its solutions.

In a solution of nitrate of silver it produces a white precipitate, which rapidly turns brown; if the hypophosphite be added in excess in the cold, it reduces the silver to the metallic state after some time; by the aid of heat the reduction is more rapid.

In a dilute solution of bichloride of mercury it produces a crystalline precipitate of chloride. If added in excess, it reduces the mercury to the metallic state.

From a solution of sulphate of copper it precipitates the oxide, which a continued ebullition reduces to the metallic state.

3. *Adulterations.*

Hypophosphite of lime may contain phosphite, phosphate, or carbonate of lime.

These three adulterations are separated by cold distilled water, in which they are insoluble.

The first gives off hyponitric acid, when acted on by concentrated nitric acid; the second calcined with a soluble salt of lead, gives globules which crystallize in regular polyhedrons; and the third gives off carbonic acid when treated with a strong acid.

It may also be adulterated with chloride of sodium, sulphate of lime, carbonate of magnesia, and oxide of zinc; these can be recognized by their usual tests.—*Lond. Pharm. Jour., Dec.* 1861, *from Repertoire de Chimie.*

ANALYSIS OF THE BARK OF ATHEROSPERMA MOSCHATUM, MONIMIACEÆ.

By N. J. Zeyer.

The author obtained this Australian drug from Dr. F. Müller, of Melbourne, and analysed it under the supervision of Professor Wittstein. Dr. O. Berg has published two years ago the following description in Archiv der Pharm. xcix. 151. It occurs in hard, heavy bent or quilled pieces, one and a half to three lines in thickness, and of different length and breadth. Externally it is of a dirty greyish brown, partly spotted with whitish lichens and with predominating serpentine longitudinal ridges, the central line of which is split. The fracture is uneven granular pale brown; the inner surface appears to the naked eye even, darker brown, finely striate. Berg describes the odor and taste strongly nutmeg-like, the author finds that both remind also somewhat of sassafras; the specific name *moschatum* must certainly not be interpreted as resembling musk.

One-eighth of a pound was successively treated with ether, alcohol, water and acid, the remaining three pounds were then distilled with water and the decoction employed for the closer examination of the more important constituents.

Ether took up tannin, which precipitated sesquichoride of iron with a brownish green color, resin, wax, fat and volatile oil. Alcohol now dissolved principally tannin, resin and an alkaloid. In the cold aqueous infusion, albumen was found, the decoction contained the above tannin and sugar, and the infusion with dilute hydrochloric acid showed the presence of oxalic acid. From the distillate with water, but a minute quantity of volatile oil could be separated, and traces of butyric acid were detected.

The residuary liquid in the still was filtered and precipitated by acetate of lead; this tannate of lead was subjected to elementary analysis, and yielded results corresponding very nearly with the formula $2PbO\ C_{20}\ H_{14}\ O_4$. The filtrate from this precipitate was treated with ammonia, the precipitate washed, dried, digested with alcohol, filtered, evaporated, treated with dilute hydrochloric acid, and again precipitated by ammonia. This alkaloid was added to a smaller quantity, obtained from the residuary bark by treating it with diluted sulphuric acid, and precipitating and purifying as before; the whole was then purified by dissolving it in bisulphide of carbon, and after removing the same, combining it with muriatic acid and precipitating by ammonia.

Thus prepared it is a white powder, with a greyish tinge, light, very electrical, inodorous and of a purely bitter taste; when triturated it adheres to the mortar like rosin. It remains unaltered in the shade, but assumes a yellowish color in the direct sunlight. Carefully heated in a test tube, it emits the odor of putrid meat, and afterwards gives off a faint odor of herrings. It fuses at 128° C. (262° F.) is nearly insoluble in water, soluble in 1000 parts of ether spec. grav. ·730 at 16° C. in 100 p. boiling ether, in 32 p. cold, and 2 p. boiling 93 per ct. alcohol; it likewise dissolves in chloroform, bisulphide of carbon, oil of turpentine and other volatile and fixed oils.

The alkaloid dissolves in and neutralizes dilute acids; concentrated nitric acid produces a brown yellow color, muriatic and sulphuric acid merely dissolve it; in the latter solution, chromate of potassa yields slowly a green color of chromic oxide. The yellowish solution in chlorine water is not affected by ammonia. From iodic acid, the alkaloid liberates iodine.

The neutral solution of the hydrochlorate shows the following behaviour to reagents: ammonia, potassa, limewater and alkaline carbonates a white precipitate insoluble in excess; nitropicric acid lemon yellow; tannin a yellowish white turbidity; iodide of potassium white, and in presence of free iodine brownish yellow; ferrocyanide of potassium white; ferridcyanide sulphur yellow; sulphocyanide white flocculent; phospho-molybdic acid, dirty yellow; terchloride of gold ochre yellow; bichloride of mercury white, soluble in water; bichloride of platinum pale greyish

yellow; nitrate of palladium yellow, with a tinge of orange red.

The author proposes for the new alkaloid the name *atherospermia*. Two elementary analysis gave somewhat different results, which seem to render the formula C_{30} H_{20} NO_5 probable.

The resin was obtained of a brown red color, and a slight aromatic odor and taste; it fuses at 114° C., and is readily soluble in alcohol, alkalies and their carbonates; ether and turpentine dissolve but traces. Its composition is C_{42} H_{32} O_{10}.

The air-dry bark yielded 3·64, after drying at 100° C. 4·05 per ct. ashes, containing 30·005 carbonic acid, 45·445 lime and a small per centage of chloride of sodium, potassa, magnesia, alum, iron, manganese, sulphuric, phosphoric, and silicic acid.—(*Wittstein's V. Schr.* x. 504–519.) J. M. M.

ON THE PREPARATION OF CINNABAR.

By Magnus Firmenich, of Cologne.

Cinnabar is most generally prepared in the dry way and on a large scale, by fusing one part of sulphur and seven parts mercury, and subjecting the fused mass to sublimation; or, as in Idria, by mixing the two elements in rotating barrels, and subliming afterwards from iron vessels. The process with sulphide of potassium is less known, but deserves the preference on account of the intensity of the color, and for the durability in fire of the product. A pure pentasulphide of potassium is necessary; those prepared by boiling an excess of sulphur in potassa, or by fusing potash with sulphur, are unfit for the purpose on account of the hyposulphite or the sulphate of potassa which is formed. Pure sulphide of potassium can only be obtained by reducing sulphate of potassa with charcoal; by saturating its solution afterwards with sulphur, the liquor is rendered fit for the process. Hessian crucibles are filled to three-fourths of their capacity, with an intimate mixture of 20 parts finely powdered sulphate of potassa, and 6 parts powdered charcoal, and heated, well covered in a furnace until effervescence ceases. This monosulphide is dissolved in 3½ parts of rain water, heated to boiling in an iron kettle, filtered and cooled to separate any undecomposed sulphate of potassa; the purified liquor is again boiled and saturated with

powdered sulphur of which four equivalents are required; it must be well protected from the atmosphere.

To prepare now the cinnabar, bottles are filled with 10 lbs. mercury, 2 lbs. sulphur, and 4½ lbs. of the above liquor; they are moderately heated, and placed in a swing in boxes, which are lined with straw, usually contain two such bottles, and are rocked against a straw cushion to increase the motion. The bottles commence to get warm after 1½ to 2 hours, and the mixture assumes a greenish brown color; the mercury combines with the sulphur of the dissolved sulphide, which is replenished by the sulphur of the mixture; to keep the latter in a loose condition, the bottles ought to be turned occasionally. The combination is completed in about 3½ hours, and the color of the mixture is now dark brown. After having been cooled slowly, the bottles are placed in a room, the temperature of which is between 35 and 40° R., (111 and 122° F.) for two or three days, during which time the mixture is well agitated three or four times daily. The temperature has an important influence on the shade of the color, which is lighter the cooler the mixture has been on being put in the swing. Light carmine cinnabar, with a tinge of yellow, is obtained by exposing the bottles in winter to the cold atmosphere for one hour, or by setting them in summer in cold water for the same space of time.

The cinnabar is now to be freed from the excess of the sulphur; about half-a-quart of water is added to each bottle, and the contents thrown on a filter; the cinnabar is then treated in stone pots with caustic soda, and after the sulphur is dissolved, the liquor is decanted and the residue washed repeatedly with fresh water, which usually requires two or three days. The complete removal of the sulphur and of the alkaline liquor is most important, the durability in fire depending on the former, and the permanence of the color upon the latter. In order to dry the cinnabar, it is first transferred to the grate in a drying closet, where a very moderate heat is used for desiccation, until it breaks into pieces, and does not appear moist to the touch. Placed upon iron pans, it is introduced into a drying oven, where it is constantly turned, and gradually heated to 50° R. (144°·5 F.) This last manipulation is finished in about five hours. By the higher heat the cinnabar assumes, temporarily, a darker shade, and its durability in fire is much increased thereby.

This process I believe to be superior to all others ; for the qualities of the product are equal to or surpass those of cinnabar made in other ways, and at the same time the cost is much lower. (*Polytechn. Centralbl.*, 1861, 1025.) J. M. M.

ON MEDICINAL EXTRACTS, TAKING BELLADONNA AS AN EXAMPLE.

By Peter Squire, F. L. S.,
President of the Pharmaceutical Society of Great Britain.

In many officinal preparations we find that there is considerable discrepancy between the processes directed to be used by the Pharmacopœia and those actually employed by manufacturers on a large scale. The dispensing Pharmaceutist may be very conscientious about his Pharmacopœia, but if his extracts are supplied to him with a label P. L., that is all he actually knows about them.

The manufacturer does not strictly follow the directions of the Pharmacopœia ; he employs the process which gives the best result, in the most direct manner. Now, up to the present time, I believe, that in some cases at any rate, the manufacturer who has desired to produce a good article has employed a better process than that given in the Pharmacopœia, probably, because he has had more practical experience than the framers of the Pharmacopœial formulæ.

Of all the officinal preparations, perhaps the extracts from the fresh herbs furnish the most striking example of this difference between precept and practice, and as the subject of the preparation of extracts has lately again occupied my attention, I have ascertained how far the practice of the manufacturer has differed from the directions of the Pharmacopœia, and to what extent he has succeeded in the quality of his product.

I may observe that the Pharmacopœia of 1851 profited by the experience of the manufacturer, for previous to that date the plants were ordered to be sprinkled with water ; the manufacturer had already dispensed with the water, and the Pharmacopœia followed the example.

The question which I wish to discuss this evening, is, whether medicinal extracts from green herbs are best prepared from leaves

only, or from all the soft parts of the plant taken together? The Pharmacopœia has for many years ordered leaves only; the manufacturers, as I shall presently show you, have employed the whole of the soft parts of the plant.

At present, I have only been able to test one plant. This opportunity was afforded me a short time since, by finding a quantity of belladonna which, on account of the severity of the winter, had only arrived at perfection at the end of September. I found it in full leaf and vigorous, partly in flower and partly in fruit. The plant was cut and conveyed to the laboratory without delay. It was trimmed—that is, the large and woody stalks were cut off and rejected. The leaves from 100 lbs. of this trimmed plant weighed 64½ lbs., and when bruised and pressed, yielded 34 lbs. of juice. The chlorophyll was separated; the juice was then coagulated, and the weight of the albumen thus precipitated weighed in its moist state 5½ ozs. The remaining juice, mixed with the chlorophyll, was then evaporated, and yielded 5 lbs. 3 ozs. of extract. The weight of the remaining soft parts, including flowers and fruit, was 35½ lbs., producing 18 lbs. of juice, 1 oz. of albumen, and 1 lb. 11 ozs. of extract.

The first of these extracts became mouldy in ten days; the second still remains perfectly good. An extract made of the whole plant, trimmed, also keeps well.

Before proceeding further I will give you the information that other manufacturers have kindly, and without reserve, afforded me. (Mr. Squire then read letters from Messrs. Allen, Herring, Holland, and Ransom, all large growers of medicinal herbs, or makers of extracts on an extensive scale.) These letters uniformly stated that the extracts made with the leaves *only* grew mouldy in a few weeks, whereas when made with the soft parts of the whole plant they would keep perfectly well, and remain of a good consistence, from one season to another.

It appears, from the experience of all manufacturers, that the juice of the stalk, &c., on account of the gum it contains, is indispensable to the preservation of the extract. The consistence is also greatly improved by it, and in the case of belladonna a plastic tenacious extract is what we require, and not one that either shrinks and becomes hard and unmanageable, or else

moulds and spoils; for it should be remembered that we have to make a plaster as well as an ointment with it.

But then comes the question, Is the extract made from these other soft parts equal to that of the leaves in power? To ascertain this, I made solutions of the same strength, of the extract of the leaves, and of that prepared from the other parts. The solution from the stalks, &c., was marked *A*, that from the leaves *B*. These solutions were put into the hands of several gentlemen for experiment upon the pupil of the eye; and by noting the time each required to dilate the pupil, and the degree of dilatation, they were able to ascertain which of them acted most powerfully. I may mention, that I have received reports from Dr. Garrod, who says that in twenty cases the results indicated that solution *A* possessed a decidedly greater power of dilating the pupil of the eye than solution *B*. Mr. Dixon, of Portman Square, says that he has only been able, from the short notice that I gave him, to try it in a few cases, but he would say that the solution marked *A* was more efficacious than that marked *B*. Mr. White Cooper had not tried the solutions sufficiently to satisfy himself in giving an opinion, and wanted more time. Mr. Streatfield gave a decided opinion in favor of A. Mr. Robert Taylor, of the Central London Ophthalmic Hospital, says the solution *A* acts much more rapidly and energetically upon the pupil of the eye than that marked *B*. Mr. Wordsworth decides in favor of *A*. All, therefore agree, that solution *A*—viz., that made from the stalks—is the more active.

We cannot, therefore, I think, resist the conclusion, that the extract from the young stalks, flowers, and fruit, taken together, is really the better extract of the two; and although we may condemn the practice of disobeying the Pharmacopœia, we cannot but regret that directions should have been given, which entail upon the manufcturer the loss of at least one-third of his produce, yield a less efficient preparation, and one that is of a bad consistence, and that will not keep longer than a few weeks.

In looking back into former Pharmacopœias, we find no mention of preparations corresponding to extracts from the green plants until 1746, when the leaves of rue and those of savine were ordered to be employed for the purpose, and were directed to be *boiled*, *strained*, and evaporated. In 1788 an extract of

hemlock was first ordered, but here the whole plant was directed to be taken, then bruised, and the juice expressed and evaporated with care; then, in 1809, these preparations, which had previously been styled inspissated juices, were installed as extracts, and the hemlock (together with aconite, belladonna, and hyoscyamus, now for the first time introduced,) were all ordered to be sprinkled with water before pressing out the juice. But for reasons with which we are not acquainted, the *leaves only* were ordered to be employed. However, Dr. Powell, the authorized translator of that edition, is by no means explicit about the matter, for in his remarks on these extracts, he says: "The texture of the *plant* is first destroyed by bruising, and its juice expressed is then evaporated." The College also directed that a small quantity of rectified spirit should be sprinkled on all the soft extracts. The Pharmacopœias of 1824 and 1836 followed exactly the steps of their predecessors, and, in the latter edition, the translator adds to the remarks of Dr. Powell just quoted, the words, "to prevent its becoming mouldy."—*Lond. Pharm. Jour., Dec.* 1861.

[On the reading of this paper an interesting discussion ensued, which is too long for insertion entire. The following outline of what was said is abridged from the published account.—*Ed. Am. Jour. Pharm.*]

Mr. Deane had some experience in making extracts of juices, and found them to keep well if evaporated without coagulating the albumen; but if evaporated below boiling, if sufficient to coagulate the albumen, yet the presence of the latter in a coagulated state would cause mouldiness. This was not so if boiling was resorted to. He had found extracts prepared in vacuo to spoil from the same causes, viz:—the partially coagulated but *uncooked* albumen. A somewhat analogous result occurred, with some other extracts, as liquorice and poppies, when made at a low temperature, as on keeping they underwent a sort of fermentation and gave off gas, which caused the swelling of the mass. Much of the efficiency, elegance and permanence of green extracts depended on the proper condition of the plants when gathered, and at the time of operating; especially was it objectionable to have the herbs to heat by lying in masses after being gathered. Plants gathered too early were more albuminous and less active. The inflorescence should be one-third over when gathered. At this age plants yielded extracts of the best consistence. Mr. Deane concluded by some remarks to young men, urging on their attention the importance of botanic studies.

Mr. Cracknell had for some years paid much attention to the preparation

of this class of extracts, and could endorse the remarks of Mr. Squire relative to the advantage of using the soft stalks and flowers with the leaves, not only as aiding the extraction of the juice, but as causing them to keep better when finished.

Mr. Francis used the whole plant and evaporated the juice in an open steam pan, at the boiling temperature, as rapidly as possible, to the consistency of treacle, and then in shallow dishes exposed to the sun. He had found extracts made from the leaves only to mould and ferment.

Mr. Haselden had seen very good extracts prepared according to the directions of the London Pharmacopœia. The difficulty was in cooking them to the right consistence. He could not assert that such extract was stronger than that from both leaves and stalks, but for commercial purposes the latter was advantageous.

Mr. Brady also advocated the views of Mr. Squire.

Mr. Heathfield, in 1831, was engaged in a course of experiments in the laboratory of the late Mr. Battley, with a view of ascertaining the qualities of the juices of narcotic plants generally, and these had included the separate juices of the leaves, buds and soft stalks from the woody stalks; and lastly from the whole plant. Each juice was coagulated by heat, and the albumen and coloring matter removed and placed in dishes. The coagula fermented much sooner than the juices; the coagulum was greatest in the juice of leaves alone; and the juices of leaves fermented sooner than that of the stalks. Mr. Battley found from 200 to 250 grains of alkaline chlorides in six gallons of conium juice. The extracts of the pure juices kept better than when the green matter was retained, and those which tended most strongly to mould contained the most albumen.

Mr. Davenport and Mr. Bottle next spoke. The latter remarked, that as the albumen and green color of extracts tended to spoil, and that those made from partially fermented herbs were dark-colored, whether he was to infer that the latter were best. In hay-making a slight fermentation increases nutrient power; does the same course favor medicinal power in these herbs?

Mr. Holland urged, after large experience in making extracts, that it was very important to use the herbs before they had undergone any change, and that herbs that had heated by fermentation yielded a much deteriorated extract. It was his practice to use all but the large stalks, and as soon after coming from the field as possible, and that such extracts had a good consistence from one season to another, whilst extracts from leaves only speedily spoiled; and that no such extract would keep unless the young stalks were included with the leaves.

Mr. Bentley made some general remarks, when Mr. Hills arose to corroborate the statements of Mr. Squire, Mr. Deane, and Mr. Cracknell. He also stated that steam heat could not be used to evaporate juices, without partially coagulating their albumen. In answer to a question of the President, Mr. Hills said, that in his laboratory one hundred weight of the leaves and

softer parts of belladonna had yielded, in 1859, 1 lb. 9¾ ozs. of extract; in 1860, 1 lb. 10½ ozs.; and in 1861, 2 lbs. 4 ozs., at a temperature below 100° F. Mr. Hills thought that the rejected coarse stems amounted to three-fourths of every hundred weight.

[The discussion was continued at an adjourned meeting, the notice of which was published in the *Pharm. Jour.* for January, from which we abridge the following.—Ed.]

Mr. Squire, in opening the subject, desired to say that nothing which had been brought forward at the last meeting should be understood as justifying a deviation from the Pharmacopœia, for the preparations it ordered; but, that while adherence to that authority was important, it was highly important, also, that its processes should be such as practical men could adopt, and which would realize the object of the framers. Since the last meeting he had had further testimony in regard to the extract marked A, from Mr. Cooper, whose results indicated that it was one-fourth stronger than the extract of the leaves alone. He then passed in review the processes of the foreign Pharmacopœias, as follows:—

The Prussian Pharm. orders 10 lbs. of the leaves and flowering branches, bruised with 1½ lbs. water, pressed; the marc treated with more water, and pressed again; the liquor strained, evaporated to 2 lbs., mixed with 2 lbs. of alcohol filtered and evaporated to an extract.

The Belgian Pharm. of 1854, orders the flowering herb to be bruised, with a small quantity of water, pressed, strained; the liquor evaporated to one-fourth or to a syrupy consistence, then spread on dishes and evaporated to dryness.

The Austrian Pharmacopœia of 1855 is like the Belgian process, except that the juice is evaporated at once to dryness.

The United States Pharmacopœia of 1850 directs the juice of the leaves to be evaporated *after* the separation and rejection of the chlorophyll and albumen.

The Norwegian Pharm. of 1854 employs the dried leaves, to be treated, first with water and then with spirit, and the liquors evaporated and mixed.

Dr. Redwood regretted his absence at the previous meeting, and felt dissatisfied with the result of the discussion, in three points of view; first, he feared that an implied justification of deviation from the Pharmacopœia by manufacturers was apparent, which should be avoided in any paper emanating from the Society. He also believed that a false impression was gained from the paper of Mr. Squire, in regard to the relative value of the extracts from the leaves and stalks of belladonna; that the so-called extracts of the stalks of Mr. S., was from the small stalks, flowers and fruit; and no evidence was produced that the stalks in the abstract yielded an efficacious extract; that such an opinion gaining credence would cause manufacturers to use only the other parts of the plant, and keep the leaves for selling as such in a dried state, or in powder; and that such a result

should be guarded against. He stated that the juice of the leaves was, by those qualified to judge, considered to be more highly elaborated than is that of the stalks, and hence the direction of the Pharmacopœia; yet he saw no objection to "the leaves and flowering tops," as suggested by Mr. Squire, provided it was not construed to mean the whole plant.

The last point which Dr. Redwood noticed, was the fact that the extract of leaves of Mr. Squire should mould *after* the albumen was removed, thus shaking confidence in this process, heretofore strongly advocated by Mr. Squire. He was convinced that in these cases the removal of the albumen had only been partial. He (Dr. R.) had never been fully convinced of the efficacy of this process, and was now inclined to favor the process that most European and American Pharmacopœias had adopted, in which both the chlorophyll and albumen were removed from the extract, and when so prepared they did not mould.

The President, (Mr. Squire,) after some further explanatory remarks, was followed by Mr. Samuel Gale, who had, in reading Mr. Squire's paper, understood extract A to be of the stalks only. He stated that at the laboratory of Bell & Co., these extracts were made by evaporating the juices at 120° F. by a water bath heat and that such extracts even when from the leaves only, keep without moulding.

Mr. Daniel Hanbury gathered from what had been said that the extract of the juice of the small stems, flowers and fruit, was better than that made from the leaves, and that the leaves might be applied for other purposes.

After a few remarks by Mr. Mee, Prof. Bentley, and Mr. Cutting, the meeting adjourned.

ON EXTRACT OF GENTIAN.

By Leibundgut.

The author dissolved 4 oz. of extract in 12 oz. of boiling 85 per cent. alcohol; after cooling, a blackish brown residue was separated by filtration, which reduced Trommer's test; 6 oz. of water were added to the filtrate and the mixture distilled; the distillate was colorless, and possessed a neutral reaction and aromatic odor and taste. The aqueous residue was, after filtration, digested with animal charcoal, and the latter, after having been washed with water, was exhausted with boiling alcohol, which on evaporation left a dark-yellow sticky residue of slight acid reaction and peculiar aromatic odor, and reducing the oxide of copper from Trommer's test. The solution in cold water was clear, and became slightly turbid by subacetate of lead. The

filtrate was freed from lead by sulphuretted hydrogen, and when evaporated left a very bitter extract. It was dissolved in alcohol and the solution agitated with ether; the alcoholic ether had retained nothing of importance in solution, while the separated syrup contained all the bitterness.

The aqueous liquid filtered from the charcoal was of a nice brown-yellow color, showed a strong iridescence in green, had a sweetish taste, and readily reduced the oxide of copper from Trommer's solution. Subacetate of lead precipitated some acids, which were scarcely acted on by sesquichloride of iron. The syrup obtained by evaporation, was dissolved in alcohol when the iridescence reappeared, and then mixed with ether, when a syrup separated which could not be crystallized; dried in the waterbath, it weighed 1½ oz. The alcoholic ether had taken up from the syrup a little of a brown bitter substance.

The author obtained the bitter principle, like Dulk, in the form of a brownish yellow extract, he intends to experiment with the fresh root of Gentiana lutea, hoping therefrom to gain the gentianine in a state unobjectionable to chemists. The above extract was prepared by the process of the Prussian Pharmacopœia.—*Achiv d. Pharm.*, cvii. 132–135. J. M. M.

SULPHUR IN CALIFORNIA.

The refining of sulphur has been commenced as a business in Santa Barbara county, Cal. Twenty miles south-eastward of the town of Santa Barbara, and seven miles back from the Mission of San Buenaventura, which is upon the sea shore, is a great bed of native sulphur, deposited in remote ages by the vapors and waters of sulphur springs. The country in the vicinity bears strong marks of volcanic action. The sulphur deposits back of San Buenaventura have long been known, but only lately has it been rendered valuable. Messrs. Davidson, Spence & Co. commenced about the first of this year to open the mine. The *Daily Alta* says, that there were then some half a dozen men at work in the mine, and this sulphur is so abundant and accessible, that the time is perhaps not far distant when it will be shipped to Europe. The crude deposit is stated to comprise 8° per cent. of sulphur.—*Scientific American.*

(Continued from page 88.)

late is so fractioned by *partial combination with a base*, and distillation as described in the examination of the watery distillate (page 280, vol. ix.) which is obtained by the decoction of the material under examination with water. The non-volatile fatty acids, partly solid and partly fluid, are treated precisely as though they had been obtained by saponification from the fatty mixture alone, which was above spoken of.

The *liquid fatty acids*, which are obtained as ethereal solutions of their lead salts, by the treatment as above given of the salts of the fatty acids with ether, may be likewise mixtures of several liquid fatty acids. After the expulsion of the ether they must be separated from the lead and thrown down by *fractional precipitation* from one another, precisely as stated for the solid fatty acids.

Since it has been discovered that not only fatty acids, but also benzoic acid, may be contained in fatty mixtures as a glyceryle compound, it is no longer improbable that the glyceryle compounds of other acids besides those of the proper fatty acids, may be found in many fats when attention is directed thereto.

To ascertain *whether other acids besides the fatty are contained or not as glyceryle compounds* in the mixture of fats, *the fluid which is obtained when the fat is saponified, and the soap separated by common salt*, is filtered and evaporated in a water bath until it is reduced to a very small volume. Glycerine and common salt are always found in this residue, besides free potash, carbonate of potash, and small quantities of dissolved soap. If glyceryle compounds of benzoic acid or of other acids were contained besides in the fat, the potash salts of the acids are dissolved likewise in this fluid. *The residue*, which is obtained by evaporation, is divided into two parts. *The first part* is mixed with a solution of chloride of calcium, which precipitates a little carbonate of lime as well as the compounds of smaller quantities of fatty acids with lime, which are insoluble in water. The lime salt of the acid, which is present in addition to the fatty acid, either precipitates or remains dissolved. If it remains dissolved, a solution of the salt of the acid sought for is obtained by filtering the fluid from the carbonate of lime, as well as from the lime salts of the fatty acids; but the solution is contaminated with glycerine and common salt. This fluid is evaporated to concentrate it. The residue is mixed with *hydrochloric acid*. If benzoic acid, or any acid difficultly soluble in cold water, is present, it is precipitated by the addition of hydrochloric acid. When nothing is thrown down, either no acid or one very soluble in water was present. To arrive at certainty on this point, *a second portion* of the residue of evaporation above mentioned is precipitated with chloride of calcium, the resulting precipitate collected and washed with water, diffused in a little water and mixed with *dilute sulphuric acid*. The decomposition is promoted by heat until it is completed. The fluid, still hot, is then filtered through a moist filter. If with the fatty acids, another acid is precipitated by chloride of calcium, as a

lime salt insoluble in water, it must be contained in this filtrate with a little free sulphuric acid. To discover the presence of an acid, which is neither difficultly soluble in water, nor gives with lime an insoluble salt, we proceed in the following way:—

A *portion of the fat* under examination *is saponified* by boiling with thin *milk of lime*, and the hot fluid containing glycerine is *filtered* from the lime soap. *Carbonic acid* is conducted into the *filtrate*, heated for the decomposition of the bicarbonate of lime, and filtered. The filtrate contains the lime salt of the acid sought for and glycerine. The fluid is mixed with basic acetate of lead, and the precipitate perchance resulting is separated by filtration from the fluid. The lead salt is washed with water, diffused in water, and decomposed by sulphuretted hydrogen. In the fluid filtered from the sulphuret of lead, the acid sought for is contained. There are only a few acids which produce no precipitate with basic acetate of lead. Should such an acid be present instead of basic acetate of lead, a solution of nitrate of silver mixed with a little ammonia is added, which precipitates a silver salt of the acid. If in this way no precipitation results, the concentrated fluid, wherein the acid and glycerine exist in solution, is digested with freshly precipitated carbonate of zinc or copper, and absolute alcohol is added to the filtered fluid, by which a zinc or copper salt of the acid is thrown down, but not the glycerine. When an acid which is volatile is mixed with the glyceryle compound in the fat, it will have been already found in the examination of the volatile fatty acids.

When *fats and resins* are mixed *with one another*, the mixture is treated with a solution of caustic potash to effect the saponification of the fats. The electro-negative resins dissolve likewise as potash compounds therein, while the indifferent resins remain undissolved. After the insoluble part of the resin has been separated, *the solution of soap and resin soap* is treated with common salt, and the soap of the fatty acids is separated, but not the resin soap. The soap which has separated is treated as previously described (page 87). The solution of resin soap, which at the same time contains the glycerine of the fat, is mixed with *dilute hydrochloric or sulphuric acids*, whereby the resinous acids are separated. They often agglomerate, particularly when heated, and may be easily taken from the fluid and further purified. Sometimes it is necessary to evaporate the liquid, because a milky fluid results with acids which will not filter clear. *The resinous acids* separated are again dissolved in *a solution of potash*, and mixed with an excess of a strong solution of potash. By these means frequently a separation of several resinous acids is effected. Many potash salts of the resins are soluble, while others are insoluble in a concentrated solution of potash.

Before I conclude, the consideration of the mixtures of resins and fats separated from the spirituous extract, by cooling or distilling off the alcohol, I must direct attention to a point in the treatment of resins. *Some resins are copulated compounds.* Two resins are already known which break

up into two products one of which is grape sugar. It is therefore probable that not only are other resins such copulated carbo-hydrates, but that some resins are compounds, which, by the action of an acid or an alkali, may be split up into two products, one of which is not grape sugar. The resins must in this respect be more minutely examined.

This examination is conducted in the manner described (pages 472, vol. ix., and 87, vol. x.) for the investigation of copulated compounds with acids and alkalies.

It is self-evident that in the presence of *several resinous acids*, their separation can be accomplished in the same manner as this is effected with non-resinous acids, namely, by *fractional precipitation*.

When the spirit is distilled off from the alcohol extract, and the separated resins, fats, and wax-like bodies are separated from the watery residue, and the watery fluid is freed from every trace of suspended substances by a moist filter, this *watery solution* is now a subject for examination.

b.— Watery residue after the removal of the alcohol from the spirituous extract or decoction.

This fluid is diluted with a little water, and precipitated with a *solution of sugar of lead*, the precipitate collected on a filter, the filtered liquid mixed with *basic acetate of lead* as long as a precipitate results; and this second precipitate is also separated from the fluid by a filter. The filtered liquid is freed from lead by sulphuretted hydrogen, from sulphuret of lead, by filtration, and from sulphuretted hydrogen by heating it. This fluid, as well as both the precipitates obtained by sugar of lead and subacetate of lead, are treated precisely as the precipitates and fluid were treated which were obtained by the corresponding treatment of the watery decoction of the material to be examined.

It is here to be remarked, that by the examination of this precipitate, as well as those obtained by sugar of lead and subacetate of lead, substances will be found which have been also found by the examination of the precipitates obtained from the watery decoction. Thus far, this examination is a control of the previous one. However, these precipitates generally exhibit a less complicated composition than those obtained from the watery decoction. The spirit does not dissolve many salts—particularly of the inorganic acids, sulphuric acid, phosphoric acid, &c. The pectine bodies are quite as little dissolved by spirit. In the precipitate obtained by sugar of lead, certain bodies are therefore absent which are precipitated by sugar of lead from the watery decoction. On the other hand, no gum is dissolved by spirit, as well as some allied substances, which would be contained in the watery decoction, and then would pass over into the precipitate which subacetate of lead produces in the watery decoction. For the preparation of many bodies it is, therefore, much better to use the precipitates which are precipitated from the watery residue of the spirituous extract than the corresponding precipitates from the watery decoction.

Although we often obtain useful results by following the prescribed

method of examination, on the contrary it will happen in many cases that this prescribed method is not the best, and must be replaced by another which renders possible the separation of bodies, which cannot be accomplished with the same precision in the method given. Particularly when coloring matters are contained in the spirituous extract, their isolation by the methods already prescribed cannot be performed quickly or perfectly.

In such cases, *the hydrate of alumina* is often employed with remarkable results for a preliminary separation of the constituents. This is prepared by precipitating a solution of alum with sulphide of ammonium, the precipitate is washed at the commencement by decantation, and then washed on a filter with water, and removed from the filter in a moist, gelatinous condition. It can be preserved in closed vessels for use in a *moist condition*, or at once employed; the gelatinous hydrate is rubbed with water, which is added by degrees in small quantities, to a smooth thin paste. This is added to the watery fluid which has been obtained after the distillation of the spirit from spirituous extract of the material under examination, and after the removal of the fatty and resinous deposits by filtration, the hydrate of alumina is diffused equally through the fluid by stirring, and allowed to remain in contact twenty-four hours, with frequent stirring. At the expiration of this time the fluid is filtered from the alumina, which is washed on a filter with water; the filtered liquid, as well as the alumina on the filter are subjected to further examination. There are bodies which combine with alumina, and others which form no combination with it. The bodies which can combine with alumina are on the filter with the alumina, which has been added in excess, in the form of salts of alumina, or are retained by the alumina in the same way that many bodies are fixed by charcoal or sulphide of lead. *The mixture of alumina and alumina compounds* is treated precisely as the alumina precipitate which has been obtained by the alum and ammonia from the watery decoction. *The liquid which is filtered from the alumina and its compounds* is precipitated with *subacetate of lead;* this precipitate is separated from the fluid by filtration, the fluid from the lead *by sulphuretted hydrogen*, and freed from the sulphuretted hydrogen by heat after the sulphuret of lead has been filtered off. This lead precipitate, and the fluid filtered therefrom, are treated like the corresponding fluid and precipitate were treated when no alumina had been previously added to the aqueous residue of the spirituous extract. Frequently, in the spirituous extract there are two coloring matters present, one of which has the nature of a resin. Such coloring matters separate cotemporaneously with the fats and resins, when the spirit is distilled from the extract, and they are isolated in the examination of the resins. Many coloring matters remain dissolved in the water after the spirit is distilled off. This case often occurs that one of the coloring matters is completely combined and retained by the freshly-precipitated alumina, with other bodies, when a sufficient quantity of alumina has been added to the fluid, while the other coloring matter remains behind in the fluid. The latter is

then precipitated with other bodies by the addition of subacetate of lead. In the majority of cases, *the coloring matter* is retained by the sulphuret of lead after the decomposition of the precipitate by sulphuretted hydrogen, so that it can be *extracted by hot alcohol from the sulphuret of lead*, after the removal of the other constituents by water.

Before concluding this chapter, I have to return to the deposits from the alcoholic tincture, which in many instances occur after the cooling, or after the distillation of the alcohol. Occasionally, a body or a mixture of bodies, is separated in the form of powders, which may be readily collected upon a filter for further examination. Sometimes, however, no deposit takes place after cooling, and after most or all of the alcohol has been distilled off, a gelatinous mass or a jelly is obtained after cooling, which, after having been mixed with water, cannot be filtered, or at least clogs the pores of the filter in a short time, thus stopping filtration completely. There remains no alternative in such cases, but to add again the distilled spirit to the residuary liquid, and to warm the whole, in order to effect a solution; this solution is then precipitated by a solution of acetate of lead in hydrated alcohol, the filtrate precipitated by subacetate of lead, and the liquid filtering from this precipitate, freed from lead by sulphuretted hydrogen. Both precipitates are treated in precisely the same manner as the precipitates obtained by acetate and subacetate of lead, from the aqueous decoction of the material under examination. The liquid which has been freed from lead by sulphuretted hydrogen, may contain substances which yield with lead compounds soluble in alcohol. The alcohol is therefore distilled off, and the aqueous residue is treated with basic acetate of lead, which will produce a precipitate, if the alcoholic solution had contained lead compounds which are insoluble in water. The liquid filtered from this precipitate is freed from lead by sulphuretted hydrogen, and can now be regarded as completely liberated from substances which are precipitated by lead; it is then further examined.

VI.—*Examination of the ethereal extract.*

The extract of the material under examination, after the ether has been separated by distillation in a water bath, will leave mostly fats or resins, or a mixture of both. It frequently contains small, seldom large quantities of other bodies, which are dissolved equally by water or spirit, and are found in the watery decoction or spirituous extract. Free acids, organic bases, and various indifferent bodies may be taken up by the ether. *The residue which remains after distilling off the ether* is consequently first *boiled* with *water*. Tannin and analogous bodies, some vegetable bases and other substances, are taken up by the water, while the fats and resins remain undissolved. The watery solution of the ethereal extract is treated precisely as the watery decoction of the material under examination. *The residue insoluble in water*, after the separation of all the water, is submitted to a further examination. A *portion* thereof is treated with sulphuret of

carbon, to ascertain whether a separation can be thereby effected into two parts. If no separation is possible, *the whole residue left, after treating the remaining portion of the ethereal extract with water*, is treated; or when a separation has been accomplished, by sulphuret of carbon; then the portion insoluble in sulphuret of carbon by itself, and the portion which remains after distilling off the sulphuret of carbon by itself, are treated as described for the mixture of fats and resins, which is obtained from the material under examination by extraction with spirit, and cooling the tincture, or by distilling off the alcohol. (See pages 84 to 179.)

VII.—*Examination of the matter extracted by spirit containing potash or ammonia.*

The solution which is obtained by spirit containing potassa or ammonia is sometimes very suitable for the isolation of substances which could only be procured with difficulty in a pure condition from the material under examination in another way. The substances whose isolation may be attempted from this solution are those which are sparingly soluble in very diluted alcohol, but are dissolved in considerable quantity by potassa or ammonia, so that the greatest portion of them is separated by an acid, while others extracted at the same time are not precipitated after the addition of an acid, because they are soluble likewise in their free state, in very dilute alcohol. Frequently, carbonic acid suffices to decompose the compounds of these substances with potash or ammonia, so that carbonate of potash and the substance which was combined with the alkali are together separated. Sometimes stronger acids, as acetic, sulphuric, or hydrochloric acid, are necessary for the decomposition. At first, therefore, *carbonic acid* is always conducted into the alkaline spirituous extract, to see whether a precipitation of organic substance takes place. When this is the case, the precipitate is filtered from the fluid and examined more closely. The filtered fluid is mixed then with hydrochloric acid, to ascertain whether a precipitate is thereby produced. In this way it is possible to separate one or more weaker acids from stronger ones. The precipitates produced by hydrochloric acid must be separated by filtration from the fluid, which is not further examined. Various peculiar bodies are readily obtained in this way pure; for example, chrysophanic acid from rhubarb and parmelia parietina, also usnic acid and analogous bodies from many lichens. The preparation of these bodies is in no other way so easily and rapidly performed as in this manner. Naturally the precipitates produced by hydrochloric acid, as well as by carbonic acid, may be not only one substance, but a mixture of several bodies, and it is therefore necessary to learn whether by treatment with *alcohol, ether and water*, a separation is possible or not into several constituents. When it is not possible to effect a separation of the mixed bodies, by their unequal solubility in these solvents, then a solution of the mixture is made in that menstruum which most readily effects its solution, such as ammoniacal water or ammoniacal spirit, and

the separation is accomplished by fractional precipitation with a suitable metallic salt. In this case it is necessary to take care that no excess of ammonia is present. *Solutions of acetate of copper, acetate of lead, or chloride of calcium* are generally the most suitable salts for fractional precipitation. By a preliminary experiment it may be learnt which is the best to employ.

By the prescribed treatment of the extract whose preparation was explained in page 13, a number of substances have been prepared, not all of which can be regarded as isolated constituents, although such may be the case with many of them. Substances which have been separated from others, by the methods described in the 2nd section, will frequently be obtained in a state of contamination with small quantities of other constituents. But as we have prepared these bodies from different extracts of the same material, according to different methods, generally twice or oftener, their peculiarities may still be recognized, even when the substance has in no case been obtained quite pure, because the impurities from the different methods of preparation must be alike. After following the directions given, and from the evidence thus obtained, it is often impossible to know whether we had to do with one individual body or several bodies. Thus, by the fractional precipitation or solution of precipitates, it must often be felt undecided whether the individual solutions or precipitations contain the same or different bodies; and when the presence of several bodies has been detected in the different solutions or precipitates, whether these individual portions are to be fractionized still further or not by a repetition of this kind of treatment, in accordance with our failure or success in isolating a body from one of these portions. The following section will treat of the manner in which we can obtain information on these points, by the aid of reagents, and of the kind of reagents which in the majority of cases will answer this purpose.

Section III.

Reagents and their application.

It has often been stated in the second section, that the further examination of a body, by the observation of its behaviour to reagents, is required, not merely to decide by its reactions the identity of a body with one already known, but chiefly to prevent constituents being overlooked by the aid of their reactions.

If we have obtained a substance by fractional solution of a precipitate, or by fractional precipitation, of which we could not previously know whether it is only one body or a mixture of two, three, or several bodies, and have divided it into several portions, and allowed a number of reagents to act on each portion, we shall be able to ascertain whether we have to do with one or several bodies differing from one another.

I am certainly far from believing that only the reagents described in the following pages are useful means for the attainment of this object, but I

have there described a number of reagents which are serviceable in the majority of cases, whose behaviour is known to organic bodies, and which every body is in a position to prepare or to procure more readily than others. I have only appended those remarks to each test which did not appear superfluous in reference to the objects of the present instructions for the analysis of vegetable substances.

1. *Perchloride of iron*, prepared by dissolving dry crystallized perchloride of iron in water. A great number of organic bodies afford with a solution of perchloride of iron, when it is added to their aqueous solutions, neither a precipitate nor a coloration. Many of the most widely-spread constituents of plants behave in their aqueous solution exactly as though this reagent was added to pure water. On the contrary, not a few compounds exist which give this reagent a remarkable coloration, or are entirely precipitated, whereby the color of the precipitate is generally a conspicuous one. There cannot be any conclusion drawn on the nature of a body which is contained in this solution, from the coloration which a solution of perchloride of iron assumes, or from the color of the precipitate produced by this reagent. Morphine, gallic acid, and the aldehyde of salicylic acid, bodies which belong to three different classes, behave very analogous to a solution of perchloride of iron. Nevertheless, this reagent is very serviceable, inasmuch as bodies which produce with other reagents very few characteristic reactions, show by this reagent when they are mixed in very small quantities with other bodies. A great number of vegetable substances afford, when their aqueous solutions are mixed with a solution of perchloride of iron, a dark green or blue coloration, as is well known. Tannin, gallic acid, and many other similar bodies, exhibit this behaviour. Other substances acquire an intense red color when their solutions are mixed with perchloride of iron. It is always advisable to add the perchloride of iron in very small quantities to the fluid under examination, as frequently the color which makes its appearance by a smaller quantity of this salt is destroyed by a larger quantity. There are substances which, by the addition of this reagent, acquire an intense color, but the color soon disappears again, and cannot be reproduced, while with other bodies a coloration results which long remains unchanged. The coloration effected by perchloride of iron is often made to disappear more quickly by the application of heat. The coloration which is developed by perchloride of iron in the solution of a substance is often quite different, according as the substance is present in a free condition, or combined to an acid, or to a base. Frequently it depends on the nature of this acid or base whether a coloration is developed or not. It is a known fact, that not all morphine salts exhibit an equally intense blue coloration when mixed with perchloride of iron, which is shown with some morphia salts every time this reagent is added. Kinic acid in a free state, in an aqueous solution, is colored intensely green by perchloride of iron, while after its neutralization with ammonia it as-

(To be continued.)

Varieties.

Dangerous character of Benzine.—A recent review of fires in this city since the 24th of October, by the fire marshal, Mr. A. W. Blackburn, refers to benzine in connection with two or three disastrous fires originating through its use. The fire marshal has been convinced that haversacks and knapsacks, made of duck or muslin, or any kind of linen or cotton fabric, when coated with paint, composed of lampblack and linseed oil, hastily and carelessly mixed, and then glazed with varnish, in which benzine is an ingredient, when packed tightly in boxes for transportation, or closely piled in heaps in manufactories, are constantly liable to take fire from spontaneous combustion. Benzine is a component part of petroleum or coal-oil in its crude state, as it comes from the earth. In refining coal-oil for burning or lighting purposes, the benzine, which is highly explosive, is got rid of by the process of distillation. From being, as it was first considered, a refuse substance, it is now fast becoming an important article of trade. In various manufacturing and mechanical arts, it has been found an admirable substitute for turpentine, and owing to the scarcity and high price of the latter article, since the blockade of the North Carolina ports, benzine, from its comparative cheapness—and, indeed, from the almost absolute necessity of the case—is fast taking its place. It makes a handsome and durable paint, and on wood and other solid surfaces, is harmless; but as an ingredient in the coating on vegetable textile material, it is, at all times, more or less dangerous. It is very volatile, and at a certain temperature rapidly assumes a gaseous form. Where articles, such as knapsacks, haversacks, etc., freshly glazed with varnish made with it, are undergoing the process of drying, especially by the heat of boilers or steam-pipes, the whole surrounding atmosphere becomes filled with benzine gas, and let combustion ensue from any cause whatever, at such a time, the apartment will be enveloped in flames with the rapidity of lightning. These facts are well worth the attentive consideration of underwriters.—*Druggists' Circular, from Tuckett's Phila. Ins. Journal.*

Test for the Purity of Acetic Acid. By JOHN LIGHTFOOT.—Whilst making experiments on pyroligneous acid with a view to make pure acetic acid, I have been at a loss for a delicate test to ascertain when the acetic acid is entirely free from "empyreuma," which, hitherto, I have found very difficult (when so dilute as not to be tasted or smelt), and I am not aware of a good test for that purpose; but I have found, by neutralizing the acetic acid suspected to contain "empyreuma," or "empyreumatic oil," by carbonate of soda or potash and adding a solution of permanganate

of potash (Condy's fluid), that, if pure, it remains pinky and unaltered; but if it contains the slightest trace of empyreuma, the permanganate of potash is immediately decolorized, and after standing a short time, a brown precipitate is produced, but this is not the case when the acetic acid is absolutely pure.--*Chemical News, London, Nov.* 30, 1861.

Cinnamates and Nitro-cinnamates.—M. E. Kopp has prepared and described many of these (*Comptes Rendus*, t. liii. p. 634). The general properties of the cinnamates he describes as follows:—Those with an alkaline base are soluble in water. The alkaline-earthy salts are but slightly soluble in the cold, but more so when heated. The earthy salts are insoluble, and are partially decomposed by boiling water. The metallic salts are almost insoluble even in boiling water, but are in general dissolved on the addition of a little acetic acid.

Nitro-cinnamic, though a weak acid, forms neutral salts, and decomposes alkaline carbonates. The alkaline salts are very soluble, the others are but slightly so, or are altogether insoluble. They all deflagrate when quickly heated.

Cinnamene, $C_{16}H_8$, is not only isomeric but completely identical with styrol. When pure it will change spontaneously into metacinnamene perfectly solid, transparent, and having all the properties, chemical and optical, of metastyrol.—*Chem. News, London, Dec.* 21, 1861.

Preservation of Proto-Iodide of Iron, by M. Vezu.—Since M. Blancard made the use of pills of iodide of iron general, by indicating a sure means of preserving them, many persons, in whose hands his formula did not succeed, have proposed other methods, now forgotten. M. Vezu proposes to shield the iodide from contact with air, by dissolving it in a fatty body—cacao-nut butter. To four parts of iodine, dissolved in the melted butter of cacao-nut, he adds six parts of reduced iron, and keeps the mixture in a semi-liquid state for three or four hours, until it takes a bottle green hue, and does not color moistened starch paper, when a thin layer is spread over it. According to M. Vezu, the iodide dissolves in butter of cacao-nut without sensibly attacking it.—*Chem. News, London, Jan.* 4, 1862, *from Repertoire de Pharmacie.*

Coal in California.—We learn from the *California Mining and Scientific Press* that a meeting of the members of the California Academy of Science, was held in San Francisco on May 15, at which Professor Blake gave an interesting description of the coal regions of Monte Diabola, accompanied with specimens of the coal. The veins are rather thin, but the coal is good bituminous. The fossils of the region belong to the tertiary formation. Professor Whitney is of opinion that the coal was formed from accumulations carried by eddies, and deposited in still water. A

considerable quantity of this coal has been taken to San Francisco, and it has tended to reduce the price of wood and the foreign coal. A plentiful supply of coal in California would tend greatly to facilitate quartz-mining, by enabling the machinery to be operated by cheap steam power. Coal will also make California a great manufacturing State.—*Chem. News, London, Aug.* 10, 1861.

Explosion in making Phosphoric Acid.—Elsner relates (*Chem. tech. Mittheilungen*, 1859–60, s. 121) that some time since as a chemist was making phosphoric acid, by acting on phosphorus with nitric acid in a retort, a tremendous explosion took place when the mixture was heated, which not only shattered the retort, but blew out all the windows, and even shook the walls of the laboratory. The cause of the explosion he supposes to be the formation of phosphuretted hydrogen from the sudden decomposition of vapor of phosphorous acid into that gas and phosphoric acid. Elsner recommends that the phosphorus should be treated with nitric acid in a large dish, so that the vapor of phosphorous acid may have free escape. —*Chem. News, London, Aug.* 10, 1861.

Emery.—The trade in emery is not, as formerly, monopolised by the Greek Government, which now levies a tax of 5 drachms per hundred weight when exported. Other hard minerals are sometimes fraudulently substituted for it, to detect which, and to determine the value of the emery, the following method is employed in Smyrna:—A plate of glass of known weight is rubbed with a certain quantity of the emery until it has no further effect; the lighter the glass has become, the better is the quality of the emery. The emery diggings of the Government are on the island of Naxos. A ferruginous clay silicate has lately been discovered upon the island of Skyno, which is not inferior in hardness to emery.—*Chem. News, London, July* 27, 1861, *from Wittst. V. Schr.*

Spontaneous Decomposition of Gun-cotton.—M. Bouet (*Comptes Rendus*, t. liii. p. 405) has remarked that the decomposition of gun-cotton in diffused light is preceded by the appearance of a reddish atmosphere, and also that the cotton prepared with nitrate of potash and sulphuric acid is sooner and more violently decomposed than that prepared with the mixed acids. The residue, he says, is also different in the two cases: that of the first is something like burnt sugar, and in the second case is of a straw color. In both cases the sides of the bottle were nearly covered with small crystals of oxalic acid, and the air contained had an acid reaction. M. Bouet demonstrated the presence of carbonic and formic acids in the atmosphere of the bottle, and he thinks it probable that cyanogen was present. No oxide of nitrogen was discoverable. The solid residue after the removal of the oxalic acid was white, and dissolved in water like gum.

M. Chevreul agreed with M. Bouet, but insisted that light was an active agent in decomposition only when air was present; and among other things he insisted on the importance of light in a sanitary point of view, the salubrity of a house greatly depending on the free admission of light as well as air.

Luca found, however, (*Ibid.* t. liii. p. 298) that gun-cotton which had been kept in the dark had undergone decomposition with the evolution of nitrous vapors. Nearly the whole of this "modified" cotton he found to be soluble in alcohol and in water—14 per cent. in the former and 78 per cent. in the latter. The products of the decomposition he intends to study further.—*Chem. News, London.*

Blue Color from Cotton Seed Oil.—Cotton seed oil is bleached by treatment with either carbonate of soda or caustic lime. In both cases a considerable residue is left after drawing off the bleached oil. This residue is treated with sulphuric acid, and distilled at a high temperature. There is then left, according to M. Kuhlmann (*Comptes Rendus*, t. liii. p. 444,) a compact mass of a deep greenish blue color. On further treatment of this mass with strong sulphuric acid, the green tint disappears, and a very intense pure blue color is produced. Other acids, phosphoric and hydrocbloric, will bring about the same change. The blue mass is a mixture of the colored substances with some sulphuric acid, sulphate of soda, and fats. The two former may be removed by washing with water; the latter by treatment with naphtha. Alcohol now dissolves the blue color, and water precipitates it from the solution chemically pure.

According to the mean of the results of three analyses, the composition of the new body was

C 70·24
H 8·35
O 21·41;

results which nearly agree with the formula $C_{34}H_{21}O_8$. The new matter could not be obtained crystallized.

Unhappily, M. Kuhlmann has not yet been able to dye with this color, but he does not despair of fixing it.—*Ibid.*

Chlorate of Potash as a Remedy for Fœtid Breath.—Many persons complain of fœtid breath who cannot attribute it to bad teeth or neglect to keep them clean; the gums and mucous membrane of the mouth are perfectly healthy. The bad odor must come either from the lungs or the stomach, and nine case out of ten it comes from the latter. In this case we have a simple, prompt and certain remedy in the chlorate of potash. Take, three hours after eating, a teaspoonful of a solution of six grammes of the chlorate in a hundred of sweetened water, and at the same time rinse the mouth with the solution.—*Boston Med. and Surg. Jour. from Gaz. des Hop.*

Oil from Asphaltum.—The London *Engineer* says that a prospectus has been issued inviting subscriptions for an increase of the capital of the Asphaltum Company to £200,000, or double its original amount. The business of the company, which is respectably constituted, is to work certain mines of asphaltum near Havana, for the distillation of oil, which commands a ready sale in England at apparently a very remunerative price. The outlay for the property in Havana has been £68,000, of which only £18,000 was in cash, the payment for the remainder being in shares, which are not to rank for dividend until ordinary holders have received 5 per cent. The purchase included from the Spanish Government the exclusive privilege of making oil from asphaltum in Cuba and Porto Rico for fifteen years, and as the annual consumption of oil in Cuba is estimated at £250,000, this is considered valuable. The directors, engineer and manager of the company are to be remunerated by a percentage on the profits.—*Druggists' Circular.*

Adulteration of Camphor.—According to the *Journal de Pharmacie d'Anvers*, gum camphor is now sometimes met with which is mixed with the artificial (hydrochloric) camphor to a considerable extent. Mr. Dumont gives as a safe reagent the behaviour of caustic ammonia towards the alcoholic solutions of such camphor.

In a tincture of pure camphor a few drops of ammonia produce a slight precipitate, which redissolves on shaking, while in a solution of hydrochloric camphor, or in a mixture of the two, ammonia gives a flocculent precipitate, which does not redissolve, and which increases in volume in proportion to the amount of such adulteration.—*Ibid.*

Cream as a Substitute for Cod-liver Oil.—M. Fonssagrives strongly recommends, in the *Bulletin de Therapeutique*, cream as a substitute for cod-liver oil in cases where the latter cannot be borne on the stomach. The dose for children is four teaspoonfuls at first, to be subsequently increased. It is to be taken undiluted, and sweetened or flavored with vanilla, which renders it more digestible. In England, it is taken with a little rum.—*Boston Med. and Surg. Jour.*

For Regularly Cracking Glass, a very expeditious plan is to use a pearl of glass melted with some soda on a platinum wire, heated before the blowpipe; the crack having been previously started with a sharp blade of first-rate cast-steel, made diamond-hard by quickly cooling.—*Chem. News, London, Aug.* 10, 1861, *from Dr. L. C. Levoir.*

Papier Fayard et Blayn.—Boil 30 parts of garlic with 500 of linseed oil, and strain, then add 60 parts of powdered sugar of lead, 30 parts of yellow ochre, and 15 of red lead, rubbed up with 500 parts oil of turpentine, and bring the mixture on satin paper by means of a flat brush. It is then dried by the stove.—*Druggists' Circular, Feb.*, 1862.

Editorial Department.

MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.—From all the indications that we have been able to observe, there appears to be every probability that the Association will hold a meeting the present year, and that the place will be Philadelphia. Should it be so determined, the members will be notified by a call of the President in the May Journals. Assuming that such will be the case, the chairman of the Executive Committee desires to call the attention of all those gentlemen who accepted subjects for investigation, at the New York meeting in 1860, to the fact, and to ask their earnest endeavors to be prepared to present them for reading in August next, so that the interest of the meeting may be sustained, even if the numbers that attend should be small. In a recent conversation with a member from Illinois, the opinion was expressed that the time selected, August 27, was one favorable for western men, and that the chances of attendance from his neighborhood were greatly in favor of an eastern locality, as business often called them to go East at that time. The following gentlemen accepted subjects in 1860, and will be expected to report in August next, viz.:

William Procter, Jr.,	Philadelphia,	Henry F. Fish,	Waterbury, Ct.,
Thomas A. Lancaster,	"	P. Wendover Bedford,	New York City,
James T. Shinn,	"	Wm. J. Watson,	"
Benj. J. Crew,	"	John Faber,	"
William R. Warner,	"	Frederick F. Meyer,	"
Charles Bullock.	"	Alexander Cushman,	"
E. Donnelly, M. D.,	"	Geo. W. Weyman,	Pittsburg, Pa.,
Geo. J. Scattergood,	"	E. M. Blatchford,	Rockford, Mass.,
Prof. Joseph Carson,	"	Frederick Stearns,	Detroit, Mich.,
Prof. Robert P. Thomas,	"	J. L. Lemberger,	Lebanon, Pa.,
Edward Parrish,	"	Henry T. Cummings,	Portland, Me.,
John M. Maisch,	"	F. Chapman Hill,	Antioch College, O.,
Thomas S. Wiegand,	"	Dr. E. R. Squibb,	Brooklyn, N. Y.,
Charles Shivers,	"	Alpheus P. Sharp,	Baltimore,
Evan T. Ellis,	"	Louis H. Dohme,	"
Wm. J. M. Gordon,	Cincinnati,	Charles Caspari,	"
Henry A. Tilden,	New Lebanon, N. Y.	James Balmer,	"
Robert Battey, M. D.,	Rome, Georgia.		

By consulting the Proceedings of 1860, page vi., or the American Journal of Pharmacy, for November, 1860, page 514, the subjects for investigation will be found stated in full.

SPECIMENS OF MATERIA MEDICA FOR THE LONDON EXHIBITION.—In the November issue of this journal our readers were informed of the intention of the Philadelphia College of Pharmacy to make an effort to get together a collection of the materia medica of the United States for deposition in

the Great Exhibition at London in June, 1862. We have recently had the pleasure of inspecting the collection, now nearly ready (Feb. 16), and have been agreeably surprised at its extent in view of the short notice and unfavorable season that has elapsed since the appointment of the committee to this service. The appearance of the collection is much enhanced in beauty and completeness by the excellent glass-ware in which it is contained, which is the product of the works of the New England Glass Company. Should no mishap occur to the collection, it will certainly be an acceptable offering to the medical and pharmaceutical department of the Exhibition, and will afford a rare opportunity to study very many products of our soil that heretofore have only been known there, if at all, though the pages of the books and journals of the United States. The recent adverse action of Congress has thrown the College on its own resources to forward the collection to London.

St. Louis Pharmaceutical Association.—A recent letter from the Secretary of this Association mentions that its condition at present is not very encouraging, but that they expect a revival with a return of better times. The following officers have been elected for the ensuing year, viz.: Thomas Scott, President; Joseph McCulloch and James Francis, Vice Presidents; James McBride, Recording Secretary; Eugene L. Massot, Corresponding Secretary, and Enno Sander, Treasurer. The committees continued as last year. In view of the depressed condition of affairs at St. Louis, the members are willing to have the meeting of the Association held where a better attendance will mark its occurrence.

Tincture of Chloride of Iron.—The following was received too late for insertion in the proper place.

Lebanon, Pa., Feb. 13, 1862.

To the Editor of the American Journal of Pharmacy:

Dear Sir,—Much has, in times past, been written and suggested about the Tincture of Chloride of Iron. Like many of my predecessors, I have frequently been disappointed in not obtaining a strictly reliable preparation made after the formula in the Pharmacopœia, with the sub. carb. of iron, as furnished by our manufacturing chemists through the city wholesale druggists. I have tried various plans as suggested by writers of previous articles appearing in your Journal, but have found none as simple and affording so reliable an article as that made strictly in accordance with our national formula—using, however, the precaution to manufacture my own subcarb. of iron, the process of which is in itself very simple.

I have had no difficulty whatever in dissolving quite rapidly in chemically pure muriatic acid, without the aid of heat, a carefully prepared subcarbonate of iron—after being properly dried and powdered.

It is quite unfortunate that the reputation of good manufacturing chemists should be hazarded by unreliable preparations that are fre-

quently met with, some of which are not so easily overcome as badly prepared and sometimes adulterated subcarb. of iron. Nothing is so convincing that such mistakes are made by them, as little *home* manipulations like the above. Yours,

Jos. L. Lemberger.

Braithwaite's Retrospect of Practical Medicine and Surgery. Forty-fourth part. Uniform American Edition. New York, 1862. W. A. Townsend, 36 Walker street. Pp. 382. Octavo.

The attention of our medical friends and readers is called to this valuable abstract of the periodical medical literature of the past six months.

Journal des Economistes; revue de la science économique et de la statisque. 2d série, No. 97. Jan., 1862. 36 francs per an., chaque numéro séparément 3 fr. 50.

The above noted journal has been received. It is filled with important articles. Among these are "The moral, intellectual and material condition of the operatives in the cotton manufacture," "The principal branches of mining industry in France and Belgium," "Bulletin of Financiering in France and abroad," and various other subjects relating to political economy.

Obituary.—Charles Augustus Smith, of Cincinnati, Ohio, died in that city on the 19th of March, 1861, of congestion of the brain, in the fifty-second year of his age. The subject of this notice has long been favorably known as a pharmaceutist, having for many years conducted a very reputable establishment in Cincinnati, the city of his adoption. Becoming in bad health, he retired from business and spent some time in the Atlantic States among his friends, and on the recovery of health returned to Cincinnati. Some time thereafter he, in conjunction with another party, purchased the Bluelick Springs, and undertook the introduction of that noted mineral water into general use, but the speculation proved a failure. Subsequently Mr. Smith entered the employment of Eckstein & Co., of Cincinnati, in charge of the manufacturing department of that large house. He afterwards became the editor and proprietor of "The Druggist," of Cincinnati, and so continued until the period of his decease. Mr. Smith was present as a delegate from the Cincinnati College of Pharmacy at the organization of the American Pharmaceutical Association in 1852, and has always, when present at its meetings, taken a marked interest in its proceedings. His name is known in connection with "Smith's Steam Displacer," as described in one of the volumes of the American Journal of Pharmacy.

In social life Mr. Smith possessed the esteem of a large circle of acquaintance, among whom his genial disposition has long made him a welcome and agreeable companion, and his well-known face and voice will be missed in the future meetings of our National Association.